

Antiseptics  
IN  
Obstetric Nursing.

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JOHN SHAW, M.D., LOND.

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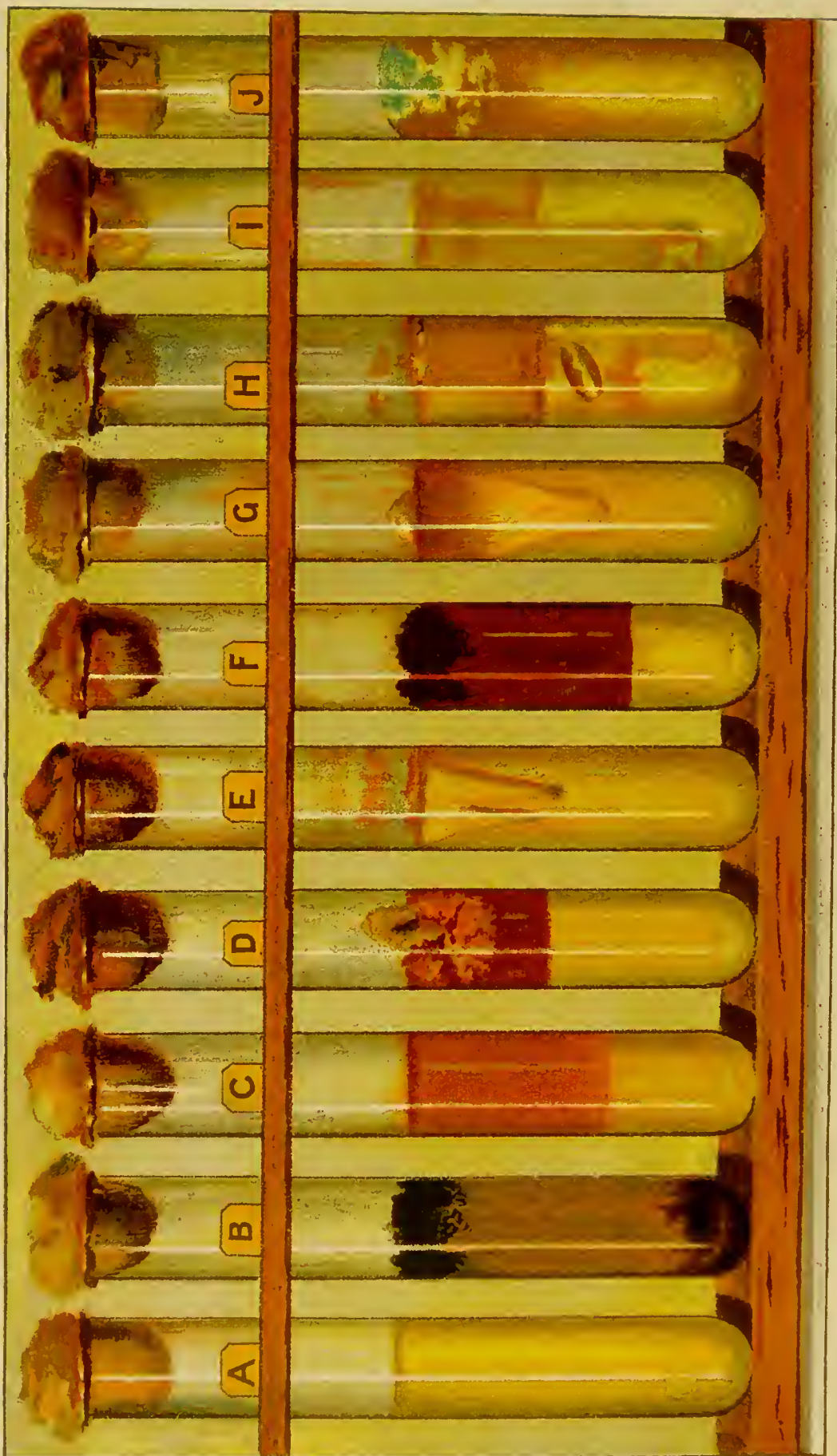




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# ANTISEPTICS

IN

## OBSTETRIC NURSING.

A TEXT-BOOK FOR NURSES ON THE APPLICATION  
OF ANTISEPTICS

TO

GYNÆCOLOGY AND MIDWIFERY,

BY

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woodcuts.*

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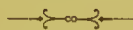


As a tribute to the Memory of  
Dr. Ignatius Phillippus Semmelweis

— and —

in grateful admiration of the genius and labours of

Sir Joseph Lister, Bart.,



“Per Angusta ad Augusta.”

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## Preface.

THIS text-book has been written to meet an individual want; it is the outcome of personal needs.

Antiseptic principles are still so imperfectly understood by the majority of nurses that disappointment is apt to attend the best intentioned efforts. It was owing to vexations of this kind that I was induced in March, 1887, to deliver a lecture to nurses on the principles of Antiseptics. In the autumn of 1889, a short course of lectures on the same subject was delivered at the Hampstead Home Hospital to a class of midwives and monthly nurses.

Although conscious of many imperfections in the mode of presenting the subject, I still hope that, published in their present form, these lectures may be of some use, especially to that large class of nurses who have not had the advantage of the thorough instruction which now characterises the curriculum of the monthly nurse; for this reason, a short glossary of such terms, as might possibly present some difficulty, is appended.

Whilst based on personal observations and needs, I must acknowledge my great indebtedness in the preparation of these chapters, first and foremost, to Dr. Cullingworth's address at St. Thomas's Hospital in October, 1888, "A plea for the more general adoption of antiseptics in midwifery practice," and to his presidential address in the section of obstetric medicine at the British Medical Association in August, 1888, "Some further applications of antiseptic principles to midwifery practice." Also to



Mr. Watson Cheyne for his "Antiseptic surgery;" for his lectures on "Suppuration and septic diseases;" and for his "Antiseptic treatment of wounds." The masterly opening of Sir Spencer Wells, and the subsequent discussion, at the Obstetrical Society, in 1875, on "The relation of puerperal fever to the infective diseases," was of great help, and to this discussion reference will frequently be made. It marked an epoch in our knowledge of the real nature and relation of septic poisons.

Other works to which I am indebted are:—"Zur Antisepsis in dem Geburtshilfe," Prof. R. Kaltenbach, in Halle. "Die Antisepsis bei Schwangeren, Gebaerenden und Wochnerinnen, &c.," Von Dr. Camillo Fuerst. "Puerperal convalescence and the diseases of the puerperal period," J. Kucher, M.D. "The contagiousness of puerperal fever," Dr. O. W. Holmes. "Puerperal fever," by the late Dr. Tilbury Fox, in the Obstetrical Soc. Trans., 1861. "Prevention of puerperal fever," and the subsequent discussion opened by Dr. Playfair, Brit. Med. Jour., vol. 2, 1887, pp. 1,034, et seq. Also Dr. Playfair's "The science and practice of midwifery;" "Manual of gynæcology," Hart and Barbour; "Puerperal diseases," Dr. Braxton Hicks, Obstet. Soc. Trans., 1871. Dr. Duka's articles in the "Lancet," July and August, 1886, furnished me with the notes on Semmelweiss. I have also copied in part some of the autotype photographs from Dr. Crookshanks' "Photography of Bacteria," as well as part of a woodcut out of Mr. Cheyne's work. The median section of the female pelvis has been altered from a plate in "Hart and Barbour." Mr. J. H. Lander painted the tubes which are represented in the chromo-lithograph in the frontispiece, as well as the drawings above referred to; my best thanks are due to him for the excellent way in which his part of the work was done. Mr. Andrews, the dispenser at the North-West London Hospital, kindly

revised the chapter on antiseptic remedies. I have to thank Mrs. Ebbetts, the Sister-Superintendent at the Hampstead Home Hospital, for certain lists of nursing requisites, which will, doubtless, be found of service, and am glad of this opportunity of expressing my obligations to her, and to the nursing staff, for their zealous application of antiseptics to obstetric nursing.

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W.

# Chapter I.

INTRODUCTION—OBSTETRICS WITHOUT ANTISEPTICS—OBSTETRICS WITH ANTISEPTICS—A PICTURE OF THE PAST AND OF THE PRESENT—DEFINITIONS—A TYPICAL CASE OF ASEPTIC AND OF SEPTIC MIDWIFERY—DR. OLIVER WENDELL HOLMES ON PUERPERAL SEPTICÆMIA—THE CAUSES OF SEPTIC POISONING—1. PREDISPOSING CAUSES, THE WINTER SEASON, DIMINISHED VITALITY, STRUCTURAL DIFFICULTIES, RETAINED SECRETIONS—2. EXCITING CAUSES—PUERPERAL FEVER ITSELF CONTAGIOUS—ERYSIPELAS—SCARLET FEVER—ILLUSTRATIVE CASES.

THE practice of obstetric medicine has, during the last few years, undergone a stupendous change.

The two great revolutionary and epoch-making forces of modern medicine, anæsthetics and antiseptics, have in no branch of the healing art exercised a greater influence than in obstetrics and gynæcology.

But lately, the subject of child-bed fever was enveloped in Egyptian darkness. Nothing can more pointedly show the hopelessness of the situation less than forty years ago, than the following quotation from the writings of a distinguished American obstetrician of that period. He says, "I prefer to attribute them" (that is, cases of puerperal fever) "to accident or Providence, of which I can form a conception, rather than to a contagion of which I cannot form any clear idea, at least, as to this particular malady." Nor can the prejudice and misconception attending its study be better exemplified than by transcribing the following from the published works of another authority—"The result of the whole discussion," he writes, "will, I trust, serve, not only to exalt your views of the value and dignity of the profession, but also to divest your minds of the overpowering dread that you can ever become,

especially to women under the extremely interesting circumstances of gestation and parturition, the ministers of evil ; that you ever convey in any possible manner, a horrible virus so destructive in its effects, and so mysterious in its operations as that attributed to Puerperal Fever."

Few of us probably have any conception of the magnitude of the interests involved. A Commission in Berlin on Puerperal Fever revealed the fact that, of 38,827,000 births occurring in the years, 1816—1875, about one in every hundred mothers died from puerperal fever. Allowing that each woman bore on an average four children, it follows that one in every twenty-five mothers perished at one birth or another, in consequence of what should be a simple and natural process. In this country, Dr. Matthews Duncan has shown that one in every hundred-and-twenty mothers dies from child-birth, of whom about three in every four succumb to child-bed fever, so that, on the averages allowed as above, it would appear that, even now, one mother in every forty dies of this pestilence.

Look at these facts from another standpoint. Insurance reports show that of all the deaths occurring in women between the ages of 19 and 29, over 18 per cent. are due to puerperal causes, and of the deaths registered between the ages of 29 and 39, over 13 per cent. arise from the same source ; in other words, all the other diseases and accidents to which women are liable, at the earlier age are less than five times as fatal as child-bearing, and at the later period, when the activity of the function is waning, child-birth is still responsible for nearly a seventh of the total mortality arising from "all the ills that flesh is heir to." To these appalling numbers must be added the vast army whose lives are enfeebled and whose usefulness is crippled by some malady dating from the period of maternity.



What antiseptics can do, what indeed they have done, for midwifery, a very few words will indicate. The mortality in the Dresden Lying-in Hospital from puerperal fever in 1887 was less than a twelfth of what it was in 1884; in the Boston Lying-in Hospital a mortality of five per cent. has been reduced in 1886 absolutely to *nil*. Similar evidence is to hand from the London Maternity Charities. During the thirty years ending 1886 it was found necessary on three separate occasions to close Queen Charlotte's Lying-in Hospital for lengthened periods owing to the high mortality then prevailing, viz., 40, 45, and 48 per thousand. The average number of deaths during the last two years has been just about one-tenth of what it had been during the thirty years preceding. In the General Lying-in Hospital in York Road puerperal fever has been almost banished, one death only having occurred during the three years ending October, 1888.

Nor is it the mortality alone that has so decreased, the amount of sickness during the lying-in term has in like proportion diminished. The statistics of the Dresden Hospital shew that in 1886, 77·8 per cent. of the mothers made a perfectly normal recovery, the temperature never exceeding 100·4 F., whilst in 1887, the number of such recoveries actually reached 95 per cent.

Antiseptics have indeed revolutionized the relation of lying-in hospitals to private practice. In the past the mortality of the former was five times as great as of the latter, whilst now it would be safe to assert that any patient has a better chance in an institution where antiseptic precautions are faithfully observed, than as the private patient of one who discards them.

These, then, are the credentials of antiseptics. The great lying-in hospitals have taken their natural place in the van-guard of the movement, but the great body of workers, inadequately instructed, is still imperfectly

equipped to resist an enemy that is ravaging the homes of rich and poor alike.

The records of the operations on the abdominal and pelvic organs shew the same ratio of improvement since the introduction of antiseptic methods and the due appreciation of the principles that underlie this system.

In order to have clearly in view the scope of this small treatise, it will first be necessary to define the terms which constitute its title. By obstetric nursing must be understood the whole province of the nurse's duty as co-worker with the obstetric physician; it includes, therefore, not only monthly nursing and the care of young infants, but also the nursing of patients suffering from diseases peculiar to women, whether medical or surgical. The term antiseptics must be regarded as comprehending not only the use of this or that chemical, but also the application in detail of all such knowledge as comes from the study of the life-history of these putridity-developing or fever-producing organisms.

Nowhere is it more true that "a little knowledge is a dangerous thing" than in the practice of antiseptics. Neither carbolic acid nor any other chemical constitutes a royal road to safety and success; it is only by the due appreciation of the facts which underlie antiseptic principles, followed by constant watchfulness, self-criticism, and 'patient continuance in well-doing,' that we can ever hope to become endowed with what may be called an antiseptic spirit. The highest development of antiseptics will have been reached when all chemical reagents can be dispensed with.

The word *antiseptic* may itself require a little explanation; it means literally that which is *opposed to the causes of putrefaction*, and now that it is indisputably proved that all putrefaction is due to the activity of minute living organisms called germs, the word antiseptic is used as

synonymous with germicide or germ-killing. *Aseptic*, a term which will be frequently employed in the course of these chapters, describes the condition in which all the *causes of putrefaction are absent*, and is indeed that state at which the practice of antiseptics aims. Nurses must often be puzzled at the different estimate formed of the value of antiseptic precautions by those who might be supposed to be in a position to judge; the secret is to be explained in the confusion which exists in the use of these terms. What we all strive at is a condition of 'asepsis,' and only because we recognize the difficulty of ensuring this, do we have recourse to the use of 'antiseptics.'

It will be well at once to understand that the diseases against which we are fighting, although called by different names according to the circumstances under which they occur, are essentially blood-poisoning due to the activity of living bodies. If the disease occurs after child-birth, it is called puerperal fever; if after operation, it is known as surgical fever, septicæmia, or pyæmia.

We shall best appreciate the objects which antiseptic precautions strive to attain, by comparing a normal lying-in period with one in which septic influences have been introduced. Let us suppose, then, that the third stage of labour has been completed, i.e., the child has been born, the after-birth removed and the mother made as comfortable as circumstances allow. She exchanges the condition of high muscular and nervous tension that had preceded and attended the birth for a period of reaction—the reaction of exhaustion; this may be more or less pronounced, but the patient is soothed by the new-found joys of motherhood and by the consciousness that the pains of travail are over. Hence it is that on the second day of the lying-in period a woman looks at her very best. On the third day there may be, and generally is, owing to the development of the milk, a slight rise of temperature, but if this does not

exceed 100 F., one feels no misgiving and can look for a return to the normal a day or two later.

The discharge called the lochia is at first almost clear blood, but from the second day onward, the red corpuscles diminishing more and more, it passes through the stages of reddish-grey to greenish-yellow, so that by the ninth day it has become clear and then ceases. With regard to the quantity of this secretion, its weight during the first three or four days has been estimated at two pounds; this is increased by another pound before it ceases. The amount is proportionately larger in those who naturally have profuse periods, or have suffered from vaginal discharge during pregnancy, as well as in those who do not nurse. The peculiar odour of the lochia, which is quite distinct from any fœtor, is due to the development of fatty acids from the disintegration of the womb tissues. It should not be forgotten, however, that the lochial discharge of a woman enjoying a perfectly normal lying-in is said to be capable of infecting a mother more recently delivered; it is alleged indeed that from the second day the lochia have inflammatory and infectious qualities. If, therefore, examinations or more especially intermediary operations, such as the repair of a ruptured perinæum, are undertaken at this period, general septic infection is more likely to result. This fact probably accounts for the rise of temperature occasionally observed on taking out the stitches after the repair of a recently ruptured perinæum.

During the first two days the womb may be slightly tender, but by the third it should be quite insensitive. For the first two or three days, moreover, if the patient has previously borne children, she may be troubled with after-pains, but these generally quickly pass away by themselves or are readily relieved by suitable means.

At the end of the second week the patient is moved on to the sofa; towards the end of the third she is allowed to



walk about a little and in the fourth week may be permitted, if all is going on well, to take a drive.

The womb, it must be remembered, does not regain its normal size for at least two months, so that if this process of shrinking (involution as it is called) is retarded by any indiscretion such as over-exertion or chill, the womb may remain enlarged and various consequent troubles ensue. This, one may readily appreciate, in remembering that the womb after the expulsion of the after-birth still weighs about one pound and a half, and that from this weight it should diminish, in the course of six or eight weeks, to one ounce and a half.

With the above sketch, contrast the case of a patient in whom some septic influence has been at work. After, perhaps, a perfectly natural labour, on the second, third, or fourth day, she complains of an indefinable sense of depression with some headache and feeling of weight at the heart; her expression is anxious; she says that she has felt very chilly or, may be, has had a regular shivering fit accompanied by chattering of the teeth. The temperature has risen, perhaps, to 103 F, and the pulse to 130 beats per minute or even higher. The skin may be hot and dry, or there may be excessive perspirations; sometimes there is a red rash. The milk is generally much diminished or is quite arrested; the lochial discharge is scanty and often offensive. Vomiting is commonly present and diarrhœa very frequently supervenes in the progress of the case, the motions being intensely fœtid. The urine is dark and often contains albumen. The tongue is coated with a thick fur, and soon becomes dry, brown and tremulous; Pain in the abdomen, often most agonising, is nearly always, though not necessarily, present. The mind may remain quite clear to the last or low muttering delirium ushers in the end.

The preceding is what may be considered a condensed sketch of a typical case of puerperal fever or other septic

attack. Fortunately, the patient does not always die, for, provided that the cause be removed, the disease may become arrested. Thus, if the symptoms arise from the retention within the womb of ill-smelling clots or fragments of after-birth, the removal of such, followed by thorough washing out of the uterine cavity, will, if done in time, lead to a prompt fall in the temperature and a return to convalescence; or, if less fortunate than this, the inflammatory processes may become arrested and the products of such inflammation may either be slowly dispersed or soften into abscess. For each death resulting from these septic diseases there are many cases of long-drawn out convalescence and of permanently damaged constitution.

Every nurse should be on the lookout for the first symptoms of septic poisoning; these, though sometimes obscure, are for the most part sufficiently obvious to arouse suspicion. The aspect of the patient is very suggestive; her expression is dull and anxious and the complexion sallow. One will often be put on one's guard by observing the patient, for her aspect may warn us of troubles ahead, even before any rise of temperature excites uneasiness. The pulse is of the greatest significance; a rise in its rapidity is of even greater importance than a rise of the thermometer. Derangement of the digestion naturally commands attention, but the most urgent symptoms are chilliness, pain or distension of the abdomen, tenderness of the womb, fœtor of the lochia, or diminution of the milk.

The early recognition of septic trouble may enable one immediately and effectually to combat it, whilst delay will only too quickly allow the malady to pass beyond the resources of art.

Dr. Oliver Wendell Holmes, speaking of these very cases once said: "No tongue can tell the heart-breaking calamity they have caused; they have closed the eyes just opened on a new world of love and happiness; they have

bowed the strength of manhood into the dust ; they have cast the helplessness of infancy into the stranger's arms, or bequeathed it with less cruelty the death of its dying parent. There is no tone too deep for regret, and no voice loud enough for warning. The woman about to become a mother, or with her new-born infant upon her bosom, should be the object of trembling care and sympathy wherever she bears her tender burden or stretches her aching limbs."

It is very important to know the recognised causes of septic poisoning, both in the lying-in woman and under surgical conditions. Though it would be premature to suppose that we are aware of all the possible sources of infection, still there are certain very definite and distinct conditions that we recognize as causes of puerperal fever, and these may be divided into two great groups ; (1) predisposing and (2) exciting causes. When one comes to consider in a future chapter the life-history of septic germs, one cannot fail to notice the striking way in which the conditions favourable to the existence and vitality of these lowly organisms correspond to those already shewn by clinical experience to predispose to puerperal and surgical fever.

(1) Predisposing causes. Season of the year appears to have an influence, more cases occurring in winter than in summer. The probable explanation is, that in summer the ventilation is principally effected through the open window, in the winter mostly by the fire, the up-draught of which exhausts the air of the room, whilst this in turn is replenished from the impure and perhaps drain contaminated air of the staircases and lower parts of the house.

Secondly, anything which impairs the general health of the patient exposes her to increased susceptibility to septic poisoning. Hence, the ill-fed, poorly-clad, spirit-drinking population very readily fall victims. Similarly,

profuse loss of blood at the confinement is a predisposing cause, as is the mental distress suffered on such an occasion by the unmarried.

Thirdly, a first confinement increases the liability to septic infection, not only from the fact that, owing to the longer duration of labour, vaginal examinations are more frequent, but also because the maternal structures, cervix, vagina, perinæum, are more liable to laceration. For the same reason, any tedious or instrumental labour is more liable to be followed by septic trouble on account of the difficulty in excluding all sources of germ infection. This was very plainly shewn in the old days where the danger of sepsis was in direct proportion to the depth to which the hand was introduced into the womb; thus, the most dangerous was manual removal of the placenta; then, turning; next, forceps, and least of all extraction by the feet. In all such cases there is great danger from the hands and nails as vehicles of infection.

Lastly, certain local conditions gravely predispose to septic poisoning. Besides the lacerations and contusions already alluded to, the principal local cause is the retention within the womb of fragments of placenta, of membranes or of blood-clot. It is an urgent necessity that these local conditions should be at once recognized and rectified. They stand in the same relation to obstetric practice that retention of discharge does to surgery; in both free drainage is necessary. This is facilitated by permitting the patient on the second or third day to be raised in bed with the shoulders supported by pillows, so that the womb is brought into a more vertical position with the result that anything contained therein will the more readily escape. The same purpose is served by allowing the patient to pass water supported on her hands and knees. It is scarcely necessary to say that in the case of a patient exhausted by severe hæmorrhage or prolonged labour these suggestions



must not be acted upon too early. It was the custom formerly (and this view is still held by some) to speak of the retention of coagula, etc., as an *exciting* cause of puerperal fever, such cases being classified as instances of self-infection. Seeing, however, that in the absence of germs introduced from without, there could be no decomposition of the retained matters, the exciting cause of the putridity and consequently of the fever has to be sought in *external* agencies.

To the exciting causes of puerperal fever most serious attention must now be directed. Some of its conditions are so obvious that there should be but very little difficulty in avoiding them; others, however, are so insidious or so obscure that only by the most watchful care can we hope to escape them. As far as is practicable, each exciting cause will be illustrated by a clinical case the more readily to impress on the mind the reality of the dangers to which carelessness or ignorance may expose the patient.

Forty-six years ago, Dr. Holmes published the book already quoted with the view of demonstrating that "The disease known as puerperal fever is so far contagious as to be frequently carried from patient to patient by physicians and nurses." The enunciation of this truth brought on Dr. Holmes at that time the most bitter reproach and opposition: to-day his opinions are universally accepted, and on his opponents will rest the lasting opprobrium of having withstood the truth. To establish his proposition, Dr. Holmes, amongst other proofs, quoted from the report of a correspondent the following series of cases:—

"The first case was in February, during a very cold time. She was confined the 4th, and died the 12th. Between the 10th and 28th of this month I attended six women in labour, all of whom did well, except the last, as also two who were confined March the 1st and 5th. Mrs. E. confined Feb. 28th, sickened and died March the 8th. The next day, the 9th, I inspected the body, and the night after attended a lady, Mrs. B., who sickened and died the 16th. The 10th I attended another, Mrs. G.,

who sickened, but recovered. March 16th I went from Mrs. G.'s room to attend a Mrs. H., who sickened the 21st. The 17th I inspected Mrs. B. On the 19th I went directly from Mrs. H.'s rooms to attend another lady, Mrs. G., who also sickened and died the 22nd. While Mrs. B. was sick on the 15th, I went directly from her room a few doors to attend another woman who was not sick. Up to the 20th of this month I wore the same clothes. I now refused to attend any labour, and did not till April 21st, when, having thoroughly cleansed myself, I resumed my practice, and had no more puerperal fever. The cases were not confined to a narrow space. The two nearest were half a mile from each other, and half that distance from my residence. The others were two or three miles apart, and nearly that distance from my residence. There were no other cases in their immediate vicinity that came to my knowledge. The general health of all the women was pretty good, and the labours as good as common, except the first. The woman, in consequence of my not arriving in time, and the child being born some time before I arrived, was very much exposed to the cold at the time of the confinement and afterwards, being confined in a very cold room. Of the six cases you perceive only one recovered. I do not recollect that there was any erysipelas or any other disease particularly prevalent at the time."

This series would seem conclusively to shew that when once a case of puerperal fever has arisen, the doctor may be the medium of carrying it from one patient to another.

At the end of the last century, Dr. Gordon of Aberdeen traced the influence of puerperal contagion so distinctly, that he was able to say: "I arrived at that certainty in the matter that I could venture to foretell what women would be affected with the disease upon hearing by what midwife they were to be delivered, or by what nurse they were to be attended during their lying-in; and in almost every instance, my prediction was verified."

Puerperal fever was considered by the late Dr. Tilbury Fox as erysipelas in the lying-in woman. This, though it does not express the whole truth, will indicate the very intimate relation in which the two stand; there is no disease more dreaded, alike by the accoucheur as by the surgeon, than erysipelas. The following instructive cases

were related to Sir Spencer Wells and were reported by him at the discussion on this subject in the Obstetrical Society fifteen years ago :—

Some years since, I left home for a few days' holiday, leaving two patients expecting their confinements. The evening before I started, my father was thrown from his horse upon the fore arm and right olecranon.\* The next morning the arm was red and swollen. Two days afterwards he attended both my patients, who had very natural labours, not requiring any assistance, and my father was not half an hour with either of them. Upon my return upon the fifth day I found both my patients dying, and my father's arm so much swollen that I had to make incisions from the elbow to the wrist. Each case had rigors in twenty four hours. Two years since I was engaged to attend the wife of a clergyman in her first confinement—a very fine, healthy lady of twenty eight. Upon entering the room, I found a nurse in attendance with an erysipelatous blush and swelling upon the side of her face. Upon enquiry, she told me that two days before she had been in a Liverpool hospital to have the nasal duct opened. My patient was seized with rigors at the end of thirty hours, and died of puerperal fever on the eighth day. The nurse died of rapid erysipelas of the head and neck on the twelfth day."

The relation of erysipelas to puerperal fever is so pronounced that, not only is there the most overwhelming evidence that erysipelas produces puerperal fever, but there is abundant proof that puerperal fever may in turn induce erysipelas or peritonitis in non-parturient women, in infants, and even in male subjects.

Scarlet fever may produce puerperal fever or septicæmia. Careful attention to the evidence brought forward on this subject will be amply repaid, not only on account of the magnitude of the interests involved, but also because of the controversy which is still waged respecting their relation.

Many have attempted to shew that scarlatina is not a cause of puerperal fever and have evidenced cases where exposure to infection has not been followed by the development of the disease. Negative testimony of this kind is,

\* The Elbow.

however, inconclusive for the following reasons:—First, the majority of mothers have already had scarlet fever. If they have not, this fact would itself indicate a certain insusceptibility, seeing that they must almost certainly at one time or another have been exposed to a contagion of such wide prevalence. In the second place, with respect to all contagia, it is true that certain persons at certain times possess a resisting power, though slight modification, either of the disease or of the individual, may suffice to render the patient susceptible to the virus. A young man whom I twice vaccinated unsuccessfully with calf-lymph developed a very good arm on making a third attempt, this time with humanised lymph. In Underwood on 'Diseases of children' it is reported that a young woman who was inoculated eight times in thirty days, whilst attending several children with small-pox, failed to take the infection, though seven weeks later she took the disease and died. All of us must have met with or heard of cases where doctors or nurses after many years' exposure to infectious disease at last fall victims to it. Lastly, it is no valid objection to the causal relationship of the two diseases that the incubation stage should be shortened and the symptoms appear earlier than after the ordinary mode of infection. Compare the usual period of incubation in small-pox, twelve days, with the seven days incubation when received by inoculation.

There appears to be no doubt that pregnant women are proof to a remarkable degree against the contagion of scarlet fever, and this is probably owing to the exalted state of nutrition and nervous energy characteristic of this state. After the birth of the child, however, it is far otherwise. As the result of the actual mechanical work of labour the blood is charged with the products of muscular contraction and nerve expenditure, taxing the excretory organs to the utmost; to a period of intense muscular and



emotional excitement succeeds a period of exhaustion, and this, as every one knows, is a time of great susceptibility to all injurious influences. Thus a parturient woman is not only more likely to receive into her system any virus to which she may be exposed, but is less able with her over-taxed organs at once to get rid of it. For this reason, seeing that it is the skin and kidneys that bear the brunt of an attack of scarlet fever, the danger to life must be proportionately greater, even though the patient present no symptoms of a puerperal nature.

The consensus of opinion among leading obstetricians is undoubtedly in favour of the view entertained by the public, viz., that puerperal fever may be developed from scarlet fever without the specific symptoms of the latter. The following is quoted from a paper by Dr. Braxton Hicks, read at the Obstetrical Society in 1870:—

Mrs. —, multipara, an excitable woman was delivered naturally. On the third day pain commenced in the uterine region, particularly in the right groin. Some excitement of mind was also present and sleeplessness. The pulse was at 120, and she was thirsty. The lochia were scanty and offensive, and the milk was scanty throughout the case. She continued much the same, though with less heat, for two days more, when, on the sixth morning, she was attacked with most violent diarrhœa, the pulse rising to 134 per minute, and very feeble. She felt great exhaustion, and refused food; there was, however, no sickness. The pain was severe in the right groin, and it was tender on pressure; in the other part of the abdomen she could bear pressure fairly. The diarrhœa ceased towards the end of the sixth day, and she rapidly sank during the night. She had no rash. The day after her death two of her children were attacked by malignant scarlet fever and shortly died.’

Compare the above with the notes of a case to which the obstetric clerk called me when resident accoucheur at St. Thomas’s:—

“M. H. æt., 31, was confined of her seventh child on Dec. 15 1880. She gives an obscure history of a rash after a previous confinement. December 19, she says, ‘the teeth began to chatter, but left off’; complains of great thirst and dryness of the throat; feeling of



sickness, but no actual vomiting; and some tenderness of the womb. The temperature is 104.4, the pulse 130, and respiration 30 per minute. The throat is red and the tongue coated with a thin, whitish fur. The bowels have not been opened since the confinement. The milk is much diminished. The discharge appears as usual in amount, and is not offensive. The womb is fairly contracted, but is rather large. The skin of the abdomen, chest, and back is covered with an intense scarlet rash, fading on pressure, but re-appearing immediately; at its confines are some red enlarged papules raised above the general surface, those about the wrist being distinctly vesicular."

The further progress of the case which Dr. Walters kindly saw for me was as follows:—

"December 20th, rash irritable, T. 104, P. 120, R. 40. No signs in the lungs; milk still further diminished; lochia natural; womb firm nearly up to the navel and tender; bowels freely opened after castor oil; some pain in both shoulders. December 21st, rash fading on the face, but as vivid as ever on the abdomen and back; uterus still at the level of the navel, firm and extremely tender; discharge watery, abundant and not offensive. T. 104, P. 108, R. 40, tongue vividly red and inclined to crack, and still very tremulous; nausea, once actually sick; enlargement of glands in both sides of the neck, also in the armpits; some pneumonic consolidation of the base of the left lung; no pain in any joint; no milk; has not slept properly since the birth of the child; wanders a little; has unpleasant spectral illusions. December 22nd, rash begins to be vesicular over the body. T. 103, P. and R., falling; uterus less tender. December 26, T. normal; also P. and R.; some cough; skin is peeling; tenderness of the womb is entirely gone; discharge natural."

How easily this case might have passed into one of puerperal fever will be acknowledged by most; there was the enlarged tender uterus which seemed only to lack the introduction of some ordinary germ of putrefaction to have developed a virulent septicæmic attack.

The extreme importance of this subject (Dr. Braxton Hicks found scarlet fever the probable cause in 37 out of 68 cases of puerperal fever), is ample apology for dwelling on this subject a little longer.

Dr. Gayton, of the N.W. District Hospital has furnished me with notes of half-a-dozen cases of scarlet fever occurring in connection with pregnancy. In three of these the patient did not abort, and the fever followed its usual course; in regard to the fourth patient, as her confinement had taken place about one month previous to the fever, her case scarcely comes within the scope of the present enquiry. In the 5th case, S.R. aet., 22., the rash came out on June 16, 1888, and on July 2nd, after pains in the back and stomach and a sanguineous discharge, she expelled a large clot, being, it is supposed, about two months pregnant. Case 6, A.D., aet., 18. Illness began January 28, 1888. On February 2, after a perfectly normal labour, she was delivered of a seven months' child which lived six hours. The after-progress was in every respect favourable, though the fever had been sharp and attended by severe throat symptoms, both tonsils and uvula being covered with thick white patches.

Cases similar to these are quoted to shew that scarlatina does not produce puerperal fever: but they prove nothing of the kind. Of the six quoted above only two are cases in point, and regarding them, it is to be observed that the patients at the time of abortion or parturition were actually protected from the *inoculation* of scarlatina, in that they already had the fever at its height or even on the decline.

The following is a summary of our present knowledge of the mutual relation of these diseases:—

1. Medical men and nurses may and occasionally do carry scarlet fever to the lying-in room.

2. Other things being equal, scarlet fever must always be a more serious danger to a lying-in woman than to another.

3. Such a patient may have scarlet fever and nothing more, the fever and the lying-in process going on side by side.

4. The absence of a typical rash is no proof against the existence of scarlet fever because the virulence of the poison may be such as to destroy the patient before the rash has time to develop, or the eruption may be so fugitive as to escape observation unless repeatedly looked for.

5. The onslaught of the scarlatinal virus will be attended, as part of the general muscular prostration, by debility of the uterine tissue and consequently by increased liability to septic absorption from the placental site. The increased body temperature, moreover, will facilitate the decomposition of any retained coagula; hence scarlet fever or any other of the acute specific fevers increases in a two-fold manner the facility with which the ordinary germs of putrefaction may induce puerperal fever.

6. If the genital tract is itself inoculated, then, by the gangrenous or diphtheritic destruction of tissue at the seat of inoculation, just as may occur in the throat, the most virulent blood-poisoning may arise.

7. From the last proposition one gathers the importance of local antiseptic treatment even where there is distinct evidence of a specific origin.

The influence of scarlet fever has been dwelt on thus fully because it is that zymotic disease which is the most fruitful in the production of puerperal fever; it is also absolutely representative of the action of the other members of the same class. Small-pox, typhus, typhoid and measles may each affect the lying-in woman and pass through its ordinary stages to convalescence, but each may, it appears, so modify the ordinary course of lying-in as to produce a fever indistinguishable from puerperal fever. The following letter from Dr. Keith, formerly of Edinboro', to Sir Spencer Wells, published in vol. 17, of the Obstet. Soc. Trans. is very instructive as shewing how similarly a given poison affects a lying-in woman and a surgical patient:—

“On May 19th my friend, who assists me at my operations, became uneasy for the first time about a puerperal case. The patient died on the 26th. On the 24th he helped me at an ovariectomy, but did not see his puerperal patient till after the operation. Next morning my patient was in a typhoid state ; she had bed-sores, all sorts of eruptions and superficial abscesses, but recovered after this pyæmic condition had lasted a month, and had no suppuration in the pelvis. On the 30th he assisted me at a tedious ovariectomy. The patient was quite well for six days ; pulse and temperature were natural. She then suddenly shivered, the pulse rose to 170, and the temperature to 106 within a few hours, and she died five days after. On the same day, the 30th, he opened a small, superficial abscess in a lady's neck. She went after this to the country, was quite well for five days, then shivered, and died five or six days after of erysipelas in the head. On June 6th he attended a simple case of natural labour in a healthy woman. She shivered the next day and died on the 10th of septicæmia. As he went home from this confinement he himself shivered, and was laid up with erysipelas of the face, from which he recovered. The medical man who attended the last puerperal case during the few days she lived examined for an instant a patient in the first stage of labour four days after the death of the last, but refused to attend her. This patient had metritis, and is now recovering, the veins of the left limb being all plugged up.”



## Chapter II.

THE EXCITING CAUSES OF SEPSIS CONTINUED—DECOMPOSING ORGANIC MATTER—THE HISTORY OF SEMMELWEISS AND OF THE VIENNA MATERNITY HOSPITAL—ILLUSTRATIVE CASES—IMPERFECT SANITATION OF THE LYING-IN ROOM—THE ORDINARY GERMS OF PUTREFACTION EXISTING IN THE AIR—WHAT IS MEANT BY SELF-INFECTION—CATARRH OF THE BLADDER FROM SEPTIC INFECTION DUE TO CATHETERISM—RARE CASES IN WHICH PUERPERAL FEVER MAY POSSIBLY ARISE FROM CAUSES OTHER THAN GERMS INTRODUCED FROM WITHOUT—THE VEHICLES OF INFECTION—THE ATMOSPHERE—PERSONAL AGENCIES—SPONGES AND INSTRUMENTS—DOMESTIC ANIMALS, ETC.—HOW TO DISINFECT ONESELF AFTER EXPOSURE TO SEPTIC CONTAGION.

HAVING in the first chapter dwelt on the contagiousness of puerperal fever, and having seen that it, as well as septic conditions after operation, could arise from the contagia of the acute specific fevers and erysipelas, the further consideration of the causes of septicæmia must now be continued. Of such morbid influences, none probably play a more active part than *dead or decaying animal matter*.

It is hard to read the history of Semmelweiss and remain in charity with the men who, by petty persecution and cantankerous criticism, worried him to an untimely end, and thus delayed for years the legitimate fruition of his teaching; but better than indignation will be the earnest effort, each in his own sphere, to reap for humanity the lessons of his life and work. He it was who first demonstrated that any material in a state of decomposition, whether derived from a dead body, or as the result of putrid changes in the fluids and discharges of the living, was able in the parturient woman to develop child-bed



fever. The life-history of Ignatius Phillippus Semmelweiss, regard it from whatever point of view we may, is of the greatest interest. Born in 1818, the youngest son of the family, he graduated as Doctor of Medicine in the University of Vienna in 1844. Owing to disappointment in the great ambition which he entertained of becoming assistant to Professor Skoda, he turned his attention to midwifery and diseases of women, and in 1846 was appointed on probation for six months as assistant to Prof. Klein in the clinique of Midwifery. The scene of his duties was the gigantic Maternity Institution at Vienna, regarding the sanitary arrangements of which, Dr. Kucher has given the following interesting details:—

“The Vienna Lying-in Hospital is enclosed on two sides by wards of the general hospital, in which wards all varieties of zymotic diseases are treated. To the rear and almost contiguous is a large military hospital; in front is a row of cesspools of an immense barracks, the stinking emanations of which can often be detected by smell in the rooms of the lying-in hospital. Under the lying-in hospital runs a large sewer, in parts of which its contents must overcome gravity and travel uphill. And, as though all this were not sufficient, the site of the lying-in hospital was once a cemetery. It would seem as if human ingenuity had done its utmost to concentrate epidemic, telluric and atmospheric influences upon this lying-in hospital, in which over nine thousand women are confined annually, and in which five hundred to eight hundred puerperal women are crowded, summer and winter, often more than thirty in a single room, almost every woman before and during labour being examined by several physicians and students.”

Dr. Kucher, 'though this rather anticipates what must be said further on, goes on to say:—

“When under such conditions the yearly mortality is less than one per cent., and sometimes only half per cent., and these results are obtained for years in the same building where, before Semmelweiss' time a mortality of ten per cent. was not very uncommon, and where it has reached fifteen and twenty per cent., and has even gone higher, no one will be surprised at my scepticism when I hear that atmospheric or telluric influences in this, that, or the other lying-in hospital has caused puerperal fever.”

The history of this maternity has been an eventful one. For the first thirty-nine years of its existence, during thirty-three years of which it had been under the control of Dr. Boer, the mortality was one and a quarter per cent. (1. 25). Under his successor, Dr. Klein, the mortality was seldom under five per cent. and often half as much again, or even more; indeed, during one epidemic of twenty months duration (Oct. 1841 to May 1843), the mortality was over sixteen per cent., i.e., one in every six women died.

The work of the hospital was divided into two clinics, that of Dr. Klein, known as No. 1, and that of Dr. Bartsch as No. 2. In both, students and midwives received instruction. About this time the government decided that the students and midwives should be instructed separately, the students being apportioned to Dr. Klein's clinic and the midwives to clinic No. 2. A remarkable change at once shewed itself, From 1841 to 1846 the mortality in clinic No. 1 was over nine per cent., whilst in the midwives' clinic it was less than four per cent.

Such then was the scene and such were the circumstances under which Semmelweiss commenced his duties as assistant. Simpson was led to the discovery of the anæsthetic properties of chloroform by the emotion excited on witnessing the sufferings of his fellows under operation; even so it was the *heart* of the young Viennese professor, wrung at the sights and sounds which daily claimed his attention, that directed his *head* and *hands* in the solution of this mystery. The bell-ringing that marked the administration of the last sacrament to some hapless patient was in his ears an ever recurring death-knell; the anguish with which some women begged on their knees to be sent home, rather than to be apportioned to the fatal clinic, affected him powerfully. He says:—

“I myself was terror-stricken; when I heard the sounds of the bells

at my door a deep sigh arose in my heart for the unfortunate mother who was the victim of a cause hitherto unknown ; this worked on me as a fresh incentive that I should, to the best of my ability, endeavour to discover the mysterious agent, and a conviction grew day by day that the prevailing fatality in the clinique No. 1 was not to be accounted for by the hitherto adopted ætiology of puerperal fevers."

The disease could not arise from the atmosphere, because in Vienna city the mortality was very slight, and in clinique No. 2 proportionately less than half; it could not be due to over-crowding, because clinique No. 2 was even more crowded than clinique No. 1, whilst manipulative skill was the same in both.

Many suggestions were offered and plans tried; the foreign students were reduced from 42 to 20, without diminution, however, of the mortality. It was said that the very sight of the priest going to a dying patient frightened another into illness. The prolonged use of the building for its present purpose was blamed; the fact, however, of clinique No. 2 having been in equally long service could not be explained away.

Meanwhile certain facts were being noted by Semmelweiss; firstly, every case of protracted labour in clinique No. 1 died, whilst in No. 2 the length of labour made but little difference. Next, in about a hundred recorded cases where the patients were delivered before admission, almost every one recovered. Again, whole rows of patients lying side by side in Dr. Klein's ward were attacked by the disease and died, though the same did not occur in clinique No. 2.

The most minute precautions were taken but without success, and at this juncture Semmelweiss' term of office expired and he had to leave. For a few months he travelled in order to learn the experience of other medical schools, and on his return was appointed for two years assistant to Prof. Klein.

At this time, Dr. Kolletschka, a personal friend of Semmelweiss, died from a dissection wound. The exact analogy between the symptoms from which his friend suffered and those which attended puerperal fever almost instantaneously flooded his mind with light.

The study of anatomy at Vienna had recently received a great impetus, and it was the custom of physicians and students occupied in anatomical studies to attend confinements without any precautions other than the simple washing of the hands in soap and water. Anyone who has been engaged in dissecting, and especially in post-mortem work, knows how the odour clings to the hands, even after repeated washings, showing that some noxious particles must be still adherent.

In May, 1847, Semmelweiss gave the famous order that all persons, previous to the examination of a parturient woman, should wash their hands in liquid chlorine (solution of chloride of lime.) The immediate result was that the mortality, which then stood at 12 per cent., was reduced in November to about 3 per cent. In October a very striking incident occurred. A parturient woman, suffering from cancer of the uterus, was admitted to the ward; twelve patients were examined after her, of whom all but one were attacked with child-bed fever and died. In November eight fatal cases resulted from infection having its origin in a patient suffering from caries of the knee, the offensive emanations of which contaminated the air of the ward. In the second year of the experiment the mortality was reduced to about one and a quarter per cent.

From the moment that Semmelweiss published his results and enunciated his theory he became the object of the bitterest dislike and opposition. Without tastes for literary work, he left the field of publicity almost entirely to his rivals, who spared no effort to subvert his teaching. At the end of twelve years, during which he had ex-



perienced keen disappointment and unmerited neglect, embittered by the opposition of the self-seeking and appalled at the consideration of how many thousands of women might at that hour have been living and well had his teaching been followed, he was bowed down by the sense of failure. As if under the shadow of coming disaster and the consciousness that his race was almost run, he wrote his work on the causation of puerperal fever. Believing that he had enunciated a truth as far reaching in its beneficence as the discovery of Jenner, with a heart as impulsive as it was generous, no wonder that the continued opposition of those who should have been the first to support him crushed his spirit, and that under such a strain, a mind deficient in the quality of patient endurance should lose its balance. Thus sadly, on the 17th August, 1865, in its 47th year closed the life of a great benefactor of his race.

The grain of wheat has died, but in dying it has borne much fruit. What Semmelweiss saw obscurely, or at best only empirically, another still living in our midst has placed on the sound basis of scientific and accurate research. To Sir Joseph Lister, endowed with those very qualities which Semmelweiss lacked, has been entrusted the mission of establishing and enlarging the truths for which the Viennese professor contended. Both of them to the remotest posterity will be of those,

“ Whose distant footsteps echo,  
Through the corridors of time.”

It might at first sight appear that nurses are but little likely to propagate disease in the manner here alluded to, but such is very far from the truth. If a vaginal tube be used for a patient suffering from any disease attended by an offensive discharge, e.g., cancer, and be afterwards employed for another patient, there is great risk to the latter. This is the case even though the patient be not



recently confined, seeing that the poisonous material may travel along the womb and the Fallopiian tubes and so reach the peritoneal cavity, a danger which is of course exaggerated if the patient is wearing a stem-pessary. There is a practice, which is said to be not uncommon amongst chemists in London, of lending on hire enema syringes for vaginal injection; it is impossible to conceive anything more fraught with danger.

It cannot be too carefully remembered that dead or decaying animal matter, such as offensive secretions or discharges, may induce the most virulent blood-poisoning. For example, if a nurse were to prepare for an operation in the same dress as that in which she had assisted at the evacuation of a foetid abscess, such as an empyema; or if she had been present at a post-mortem examination and then attended an operation without suitable change of dress, only too likely she might convey septic infection to her patient.

How obscure, almost impenetrable, may be the mystery surrounding some cases of child-bed or other septic fever, cannot be better exemplified than by the case of Dr. R., of Philadelphia. He had 45 cases of puerperal fever in his own practice in one year, though none of his neighbours' patients were attacked. To rid himself of the mysterious influence which seemed to attend upon his practice he left the city for ten days, and before waiting on another parturient case, had his hair shaved off and put on a wig, took a hot bath and changed every article of his apparel, taking nothing with him that he had worn or carried, as far as he knew, on any previous occasion. The lady, notwithstanding that she had an easy parturition, was seized next day with child-bed fever and died on the eleventh day after the birth of the child. Two years later he made another attempt at self-purification, and the next case fell a victim to the same disease.

Subsequently it was discovered that Dr. R. was suffering from an ozæna, that is a disease of the nose attended by offensive discharge; the use of his handkerchief kept his hands constantly infected with septic matter. He had 95 cases of puerperal fever in less than five years with 18 deaths.

A precisely similar series of cases here in London was brought to light at an inquest in September, 1889. The midwife had had seven deaths from puerperal fever in a few weeks. In August she had gone away for a week's holiday, when her house and clothes were disinfected. On resuming work, the same fatality attended her practice. The explanation of all this was found in the discovery of a piece of dead bone in the midwife's mouth.

It has suggested itself to me how easily one's hands might become infected by stroking a dog or cat, creatures whose nature it is to seek out objectionable animal refuse, especially if, as not uncommonly happens, they are suffering from any wound or discharging sore. Another mode in which domestic animals may spread infection will be pointed out subsequently.

It will scarcely be necessary to remind you that a with-low or a fester on the hands might be a source of infection, just as well as the discharge from any other abscess or ulcer.

A few years ago it was a matter of common observation that child-bed fever occurred with undue frequency in newly-built houses. The cause, probably, was this: too often such houses were built on sites where, the natural soil having been taken away for brick-making, the excavations were filled up from refuse heaps. The emanations from such a foundation contain all the necessary elements to excite the disease. Another explanation has been suggested, viz., that new houses are frequently furnished with second-hand goods, including

bedding, and this might well be the unsuspected source of infection.

Dr. Playfair records a striking case of the influence of *sewer-gas* in the production of puerperal mischief:—

“In a case I saw some years ago at Notting Hill, the patient who had been confined within a week had all the symptoms of an intense attack of septicæmia, but none of a diphtheritic character, while her husband lay in an adjoining room suffering from a diphtheritic sore throat. Here the waste-pipe of the bath was found to communicate directly with the sewer. In spite of her intense illness I had the patient removed to another house, and from that moment she began to improve.”

In the early part of last winter I removed two ovaries symmetrically affected with malignant disease. The morning was black with a dense fog, but, rather than put the patient to the prolonged suspense of deferring the operation, it was proceeded with. Two days afterwards some septic symptoms developed, and gave the greatest anxiety, though eventually the patient made a good recovery. It is plain that a thick, heavy atmosphere, loaded with solid particles, is not the most promising, especially in the absence of the spray, for an aseptic operation.

If the *ordinary germs of putrefaction* which are everywhere present in the lower atmosphere are introduced within the generative tract, decomposition of the ordinary lochial discharge ensues, and symptoms of septic absorption follow, which are of course intensified, if a fragment of placenta, membrane, or clot is retained within the womb.

Such germ-bearing air may actually be sucked into the vagina and uterus by the movements of the patient, if the binder is carelessly adjusted; or the same result may apparently be brought about in consequence of the alternate contraction and relaxation of the womb, especially if the perinæum is ruptured and left unrepaired.

More commonly, however, these germs are introduced by something brought in contact with the genitalia, *e.g.*, a dirty sponge, or the hand of the accoucheur or nurse.

It is clear that the material which decomposes is furnished by the patient, and so such cases are often instanced as examples of "self-infection." The germs, however, which excite the putridity come from without, so that it is scarcely logical to speak of them as instances of *self*-infection, for without germs there can be no decomposition, no putridity.

There is one affection in which the ordinary germs of putrefaction play such an important part that it becomes of the greatest interest to every obstetric nurse, viz., inflammation of the bladder, caused by the employment of an imperfectly cleansed catheter. As a catheter is withdrawn from the bladder, not only is it wet with urine, but it is streaked with organic matter, such as mucus. The bacteria of the air, meeting with suitable nourishment in this organic matter, grow rapidly, and probably the next time the catheter is passed, a vigorous colony of germs is introduced therewith to carry on in the bladder their work of fermentation. The urea of the urine is decomposed into carbonate of ammonia, which renders the urine alkaline, and causes a deposit of triple phosphate. The foetid urine inflames the mucous membrane of the bladder, much thick mucus is poured out, and the distressing train of symptoms due to inflammation supervenes. This, unfortunately, may further spread along the ureters to the kidneys, producing abscesses, and too often leading to the early death of the patient.

So far every case of puerperal or other septic fever has been traced to agencies introduced from without; it is reasonable, therefore, to ask, "Does this disease ever have an internal origin?" Many thoughtful observers would answer, "No." "To admit," says Fritsch, "the existence



of a spontaneous infection is to take a long step backwards." "The doctrine of auto-genesis," says Parvin, "is a confession of ignorance, the creed of fatalism, the very cry of despair . . . the very pessimism of obstetric practice." Statements so sweeping, however, might be the means of inflicting unmerited reproach on innocent people.

That there may very rarely be cases of child-bed fever, indistinguishable from those due to septic infection, but occurring in spite of the most rigid antiseptic precautions, it will be hard to deny in view of considerations such as the following :—

Firstly, there is such a thing as simple inflammatory fever, resulting from chill. Last year I saw a lady who, as the result of severe and repeated chills, developed all the symptoms of blood-poisoning, without any localized inflammation that could be detected. The patient died suddenly, presumably from clot in the heart. Now, supposing a patient, similarly exposed, had, in the interval of exposure and the development of the symptoms, been confined or miscarried, would not one, without hesitation, attribute her death to puerperal fever? Dr. Richardson quoted just such a case in the discussion on puerperal fever so often alluded to. It is also to be noted that the first case in the series related by Dr. Holmes (see page 11) apparently arose from chill.

Secondly, before the germ origin of these diseases was so clearly established, severe mental shock was certainly considered to be a cause. The following statement is borrowed from Dr. C. West :—

"I remember the case of a lady, who progressed perfectly well after an easy labour for ten days ; but after some violent scene of domestic strife with her husband, she was seized almost immediately with symptoms of puerperal fever, at a time when no such disease was prevalent, and of that disease she died."

When the fact is remembered that nutrition is so



disorganized by severe mental emotion as even to change the colour of the hair, or so to alter the character of a mother's milk, as to make it actually poisonous to her infant, is it impossible that, immediately or soon after labour, intense emotion may so change the normal discharge as to develop one of poisonous qualities, the absorption of which would naturally lead to septic symptoms?

Thirdly, should an old accumulation of pus in a Fallopian tube exist, or if an old abscess discharge into the vagina by a fistulous tract, then the patient in such a case might evidently be infected from material actually existent in her body. Since writing the above, such a case has occurred in my practice. An old-standing pelvic abscess was actually discharging into the vagina immediately before the confinement. The danger was further complicated by the necessity for the artificial induction of labour, owing to the presence of a large quantity of albumen in the urine. Considering that the progress of this case was as uneventful as the simplest confinement could be, one can only thankfully acknowledge our indebtedness to the heaven-sent blessing of antiseptics.

It seems to me just to qualify a universal statement by certain restrictive considerations; but looked at closer these will be seen to be really 'exceptions which prove the rule.' The septic matter in the last case was really introduced from without, though perhaps long prior to the confinement; in the two former cases, the irritant poison developed by chill or fright may, and probably will, be shewn to be of similar character to that developed by bacterial agency. It is but fair, however, that the profession and the public should recognise that in any case of puerperal fever, the burden of proof lies with the doctor, midwife or nurse, to shew that the most conscientious antiseptic precautions have been adopted.

Having, then, reviewed the sources whence septic disease may arise, let us consider the modes and means by which such infection may be carried to the patient. The first medium which claims our attention is the *atmosphere* itself. This may be polluted by the emanations arising, either from the putrid discharges of other patients as was the case in some of Semmelweiss' patients already alluded to, or even from the very walls of the hospital. Some plaster taken from one of the old Paris hospitals was found on analysis to contain an absolutely incredible quantity of organic matter. Occasionally it has happened that soakage from the leak in a drain-pipe, either into the plaster of the walls or beneath the boards of the floor, has led to septicæmic attacks in patients lying in adjacent beds.

In all probability pollution of the atmosphere may induce septicæmia without any direct infection of the wound or placental surface. This view is supported by such considerations as these:—a moderate dose of one of these putrid poisons may be injected into an animal without inducing any disease beyond a slight feverish attack, provided it is in good health; if otherwise, and especially if any organic lesion such as a strain or bruise co-exists, septicæmia is likely to follow. Again, it is very noticeable that after exposure to noxious effluvia the ejecta from the body are very frequently characterised by exactly the same odour, suggesting that such must have been absorbed by the blood to be subsequently excreted by the intestinal mucous membrane. In the light of these facts, it becomes evident that purity of the atmosphere is of paramount importance, both to a lying-in woman and to a surgical patient, not simply at the time of operation or accouchement, but right up to the establishment of convalescence. Hence it becomes the duty of the nurse, not only to carefully superintend the ventilation of the room, but also to

see that the patient is exempted from any and every influence which might contaminate the atmosphere.

The ventilation should always be from the outer air; an excellent plan, other circumstances permitting, is to *flush* the room with air many times a day by first covering up the patient, head and all, and then opening the windows, not only of the patient's room, but also of the other rooms and staircase on the same floor, so as to induce a through draught of fresh air. This may be continued for from one to five minutes according to the season of the year. After closing the doors and returning the windows to their former position—for, unless the weather is of exceptional severity they should always be a little open at the top and bottom—after a minute or two the patient is uncovered, this slight delay having allowed any currents of cold air to have subsided. The windows on the staircases and in any ante-room should always be well open. The management of the ventilation demands from the nurse the exercise of much discretion and tact, for, on the one hand she must very carefully avoid chilling the patient, and on the other she must maintain a pure state of the air. Soiled linen and all excreta must be instantly removed from the sick room.

The following case is reported from the debate at the Obstetrical Society so often alluded to:—

“A primipara, aged thirty-three, who had suffered a good deal throughout her pregnancy from sickness and general debility, was delivered naturally, after a favourable labour, of a living child, and progressed favourably for a couple of days. She was nursed by her mother-in-law, who persisted in keeping the room at stove heat. On the third day the patient had rigors, and severe symptoms soon set in, but subsided on the arrival of a more intelligent nurse. Unfortunately, this person was soon called away, the mother-in-law became once more in the ascendant, stove-heat was renewed, all my orders were disregarded, and the patient died on the tenth day after her confinement with every symptom of blood-poisoning.”

Even more important than the air is the part played by *personal agencies* in the spread of infection, and from the nature of their duties it is the doctor and nurse who are the most likely to be concerned. Now, unquestionably, infection may be carried in the *clothes*. It is not yet a matter of ancient history that the dirtiest and shabbiest of coats was considered good enough for operations, and the surgeon donned on these occasions a garment which, to the eye certainly, and perhaps to the nose, bore unmistakable evidence of long and faithful service. That the dress worn should be above suspicion, that aprons should be scrupulously clean it is scarcely necessary to insist. The part of the dress most likely to carry infection is the *fore-arm with its cuffs*; these latter should always be removed previous to making any examination, as they can never be worn with safety, and the sleeve should then be protected with a linen armlet extending from the wrist to just above the elbow, or with a folded napkin. Armlets made of Japanese waterproof paper would be very useful as they could be destroyed immediately on the conclusion of the case.

In the same discussion at the Obstetrical Society more than one speaker dwelt on the fact that the *personal entity* of the medical attendant or nurse rather than the clothes might be the vehicle of the poison.

Dr. H. related the following:—

“About ten years ago, in December, 1864, I had an outbreak of puerperal fever in my practice. I was then a very young man, and the anguish of mind which it caused me was something which I shall never forget. In the course of two months I attended fourteen cases of labour, five of which died. All the cases that I attended were not affected by the disease; at intervals two or three escaped; however, at the end of two months, I think two patients died. Then I was obliged to relinquish practice, having come to the conclusion that the disease was in some measure connected with myself, for, although there were four other practitioners in our district, not one had a case of the kind. I was forced



to the conclusion that coincidence could not account for such a continued sequence of cases, and that I was the cause of propagating the disease. But how could I propagate it? That was a matter which exercised me for many a day. We had small-pox very prevalent in our midst, but no other infectious disease. I was then attending a case of severe burns with great suppuration, but that I only dressed for a few days, and I think it very unlikely that the infection could be carried from such a source for two months continuously. If it were so, I think such instances would be very frequent, and I could not but consider it absurd in the extreme to think that for weeks, considering all the precautions that I took, frequent ablution, and change of clothes, I still kept the disease. It seemed to me then, and I have no reason to change my opinion now, that the disease was in some way or other reproduced; and the only source from which I thought it could be reproduced was from some poison generated in mal-assimilation, or in some defect in the secretory or excretory system. Arguing from analogy I see no reason to doubt that many infectious diseases are propagated in this way and not from clothing. Supposing a nurse is attending a case of scarlet fever for weeks, does she not have the germs of scarlatinal poison entering her system and being exhaled from it, and can we suppose that the disease cannot be communicated? There is no proof at all that the clothes communicate the disease always."

Dr. Barnes in the same discussion said:—

"I believe it may be propagated by the breath of a medical man or nurse. . . . A man may walk about charged with infective disease."

Dr. Swayne, of Clifton, also said:—

"As to the mode in which the infection of puerperal fever is conveyed, I think that it is generally by the person of the accoucheur more than by the clothes or any other way. Some men are peculiarly unfortunate in this respect. It is often observed that all the puerperal cases in a district are limited to a few practitioners. It is not only that they have the run of them at a particular time, but even after a long interval it is the same men who get them. Some men, I believe, have the power of absorbing and exhaling these poisons to a much greater extent than others; and from remarks I have made in my own experience I am inclined to think that the poison is much more likely to be given off by the skin than by the breath of the practitioner. I have come to the conclusion that men who have moist, perspirable skins, especially moist hands, are much more likely to exhale it than those whose hands

are generally dry and cool, especially if they have to make frequent examinations during labour."

Another fruitful source of evil is the use of imperfectly cleansed *sponges and instruments*. The more completely we can dispense with sponges the better, replacing them by some antiseptic material that can afterwards be destroyed. In a subsequent chapter, the necessary treatment of sponges will be dwelt on with as much fulness as possible; here it will only be necessary to point out the urgent necessity of cleansing all instruments *immediately after use before they are returned to their cases*, lest having once soiled the case, the latter may be the means of re-infecting the instruments, time after time, though subsequently the instruments themselves be thoroughly disinfected on each occasion after use. Such an instance was once reported, where a wash-leather case in which a doctor carried his midwifery forceps was the means of propagating puerperal fever in spite of the most careful antiseptic after-care.

The following cases quoted by Dr. O. W. Holmes from the Medical Examiner for December 10, 1842, in the work already alluded to, are of great significance:—

'Seven females, delivered by Dr. J. in rapid succession, whilst practising in Northumberland county, were all attacked with puerperal fever, and five of them died.' "Women," he said, "who had expected me to attend them, now becoming alarmed, removed out of my reach, and others sent for a physician residing several miles distant. These women, as well as those attended by midwives, all did well; nor did we hear of any deaths from child-bed within a radius of fifty miles, excepting two, and these I afterwards ascertained had been caused by other diseases."

"He underwent, as he thought, a thorough purification, and still his next patient was attacked with the disease and died. He was led to suspect that the contagion might have been carried in the gloves which he had worn in attendance upon the previous cases. Two months or more after this he had two other cases. He could find nothing to account for them, unless it were the instruments for giving enemata,

which had been used in two of the former cases, and were employed by these patients. When the first case occurred, he was attending and dressing a limb extensively mortified from erysipelas, and went immediately to the accouchement with his clothes and gloves most thoroughly imbued with its effluvia."

It is impossible to ascertain with exactitude the part which *domestic animals* play in the spread of infection, but from what one observes in general medical practice it is probably a very important one; in the same way, it is by no means improbable that they may act a very leading part in some obscure cases of septic poisoning which seem to baffle all investigation. Reference has been made to them with respect to their habits as carnivora. In a general hospital a fresh source of possible danger occurs, seeing that such domestic animals in their perambulations may readily be the vehicle of contagion between the erysipelas wards and the surgical beds.

Such then are some of the principal methods by means of which infection is conveyed; of course they do not exhaust the list, but are merely given as suggestions to direct observation in discovering, and so avoiding, the various sources of septic trouble.

From what has been said, it is quite plain that no monthly nurse should under any circumstances undertake an infectious case, seeing that she might become impregnated with the poison and as Dr. Barnes said, ". . . walk about charged with infective disease." After attendance on a case of septicæmia, the nurse should, before going to a fresh patient, take at least a week's holiday, during which time she should have frequent baths including thorough washing of the hair, and repeated complete changes of wearing apparel. The clothing should be efficiently disinfected, either by sulphurous acid or by baking. The parish vestry will generally undertake this duty. The hands and arms should be thoroughly washed,

day after day, in a solution of perchloride of mercury, 1 in 1,000. There is probably no means more effectual in ridding the system of infective taint than the free use of the Turkish bath. Unless other things contraindicate it, the use of the bath twice or thrice during the week's holiday would be alike a great pleasure and a valuable precaution.



## Chapter III.

PUTREFACTION THE RESULT OF THE VITAL ACTION OF GERMS—SEPTIC DISEASE DUE TO THE ABSORPTION OF SUCH PUTRID MATERIAL—MANY OTHER DISEASES OF GERM ORIGIN—GERMS—FOUR CLASSES—THEIR LIFE-HISTORY—CONDITIONS FAVOURING THEIR DEVELOPMENT IN THE BODY AND OUTSIDE IT—THE MOULDS—FLASK AND TUBE EXPERIMENTS ILLUSTRATING CERTAIN ERRORS IN NURSING, WITH THE LESSONS TO BE DRAWN THEREFROM—POINTS IN THE ANATOMY OF THE FEMALE ORGANS OF GENERATION HAVING DIRECT BEARING ON OBSTETRIC NURSING.

HAVING in the two former chapters reviewed the sources whence septicæmia may arise, and considered the principal means by which the poison is propagated, the next step is to inquire why causes apparently so diverse have effects so similar, and why the female genital tract is peculiarly liable to such infection; in other words one must briefly sketch the life-history of these fever-producing germs, and then say a few words on certain anatomical details of the female organs of generation.

Everyone knows that if any animal fluid, such as beef-tea, is allowed to stand a few days, in a longer or shorter time, according to the season of the year and the character of the atmosphere, it turns bad, that is, it becomes thick and cloudy, and emits a bad odour. We are so accustomed to things “going bad” that it has perhaps never occurred to some of us to inquire why they do so.

It is curious that the modern science of antiseptics, with all the blessings that it has brought to mankind, may be said to have had its origin in domestic experiments. M. Appert published in 1803 his method for preserving animal and vegetable substances. This consisted in

placing the materials to be preserved in bottles very closely corked. These bottles were then exposed to the temperature of boiling water for a longer or shorter time. They were then packed up and kept for use. Why does fruit, when treated in this manner, keep good for an indefinite time, whilst under ordinary conditions it quickly putrefies?

It will not be necessary for the present purpose to trace step by step the way in which this problem has been solved; let it suffice to state the conclusion arrived at, viz., that throughout the atmosphere and consequently on everything exposed to it, dust is everywhere present, and that this dust consists very largely of living organisms possessed of the power, when planted in a suitable soil, not only of rapid growth and multiplication, but also of generating as the result of their activity the noxious fluids and gases so characteristic of putrefaction. These products, if absorbed into the blood, give rise to the signs and symptoms of blood-poisoning, and one cannot too plainly recognize the fact that the simple neglect of measures to destroy these dust-organisms may, by allowing decomposition of the natural discharges, lead to septic poisoning.

The progress of knowledge, moreover, reveals the fact that other diseases besides septic ones are really due to such lowly organisms. Erysipelas, as was shewn in a previous chapter, is a frequent cause of puerperal fever, and in the plate at page 42 (fig. 1) is a representation of the germs (micrococci) seen in the advancing border of an erysipelatous patch. This figure will also help to demonstrate that the manner, in which the ordinary germs of putrefaction poison the system, differs materially from that in which erysipelas may act; the former lead to the development of chemical substances, the absorption of which by denuded surfaces induces the symptoms, whilst the latter penetrate into the very tissue of the womb, leading to its destruction by sloughing, or else forming plugs in

the veins which only too readily soften into abscess or are carried to distant parts of the body, there to form fresh foci of disease, whilst at the same time they shed into the blood a virus that induces the same or similar symptoms of blood-poisoning to those observed in cases due to a putrefactive origin. It is evident that these two classes of cases will differ widely in prognosis; in the one case early irrigation of the interior of the womb will get rid of the noxious material, and in all probability lead to a speedy return to a normal condition, whilst in the other case the tissues themselves may be so far involved as to have passed beyond the resources of our art. This would constitute an additional reason, were such necessary, why an acute specific illness such as scarlet fever or erysipelas should be regarded with such apprehension by those engaged in obstetric practice.

It is now high time that something should be said as to the nature of these germs to which such frequent reference has been made. In tracing the animal and vegetable kingdoms each to their lowest members, one comes at length to minute bodies, regarding which it is almost impossible to say whether they belong to the animal or to the vegetable world; they are just little masses of matter, in chemical composition allied to the white of egg, but with this essential distinction that they are endowed with life. To this group belong the germs which play such an important part in "the ills that flesh is heir to."

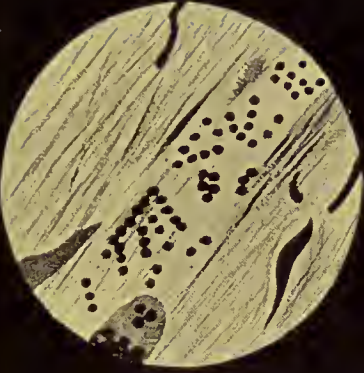
According to their shape they are divided into four classes:—(1) micrococci, which are round bodies; (2) bacteria or oval shaped ones; (3) bacilli, which are rod-shaped and are of different lengths, and (4) spirochetæ or spiral filaments. As examples of each take the micrococci of erysipelas, the bacteria of putrid blood-serum, the bacilli of tubercle and the spirochetæ found in the blood of re-

lapsing fever. In size these organisms are exceedingly minute. The micrococcus on which the decay in teeth depends measures about 1-20,000th of an inch in diameter ; this means that, if we suppose a very small cubic box each side of which is one-tenth of an inch—a box smaller indeed than anyone of us has probably seen, then such a box would be capable of holding eight thousand millions of these micrococci.

Some of these little organisms are just structureless specks of living jelly, others again have an envelope which may be regarded as a thickening of their own substance. Some are endowed with motion, the activity of which is increased by air ; others are motionless, either throughout their existence or during part of it. Motionless germs tend to grow together in masses bound to one another by a glue-like material. In all such cases they grow by division so that either a chain or a cluster of germs results. The rate of growth is very rapid, a common estimate being that they double themselves once or twice every hour. Taking the lower of these estimates it follows that in the course of twenty-four hours a solitary germ would become a colony of between sixteen and seventeen millions. With warmth and moisture and suitable nourishment the rate of growth is proportionately increased.

Germs do not, however, grow by division only ; they are also re-produced, as in the case of bacilli, by spore-formation. At one or more points in a rod an oval spot appears which soon becomes brighter and more clearly defined ; these bright spots are the spores which become free as the remainder of the rod dissolves away. Thus developed they are exceedingly tenacious of life and will retain their vitality for years, ready at any moment, if placed in suitable surroundings, to develop into fully formed germs. Many antiseptics will readily destroy the adult germs but will not harm the spores, or will do so only after

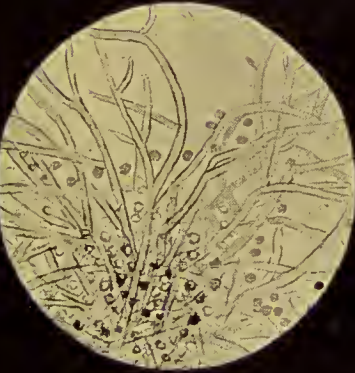




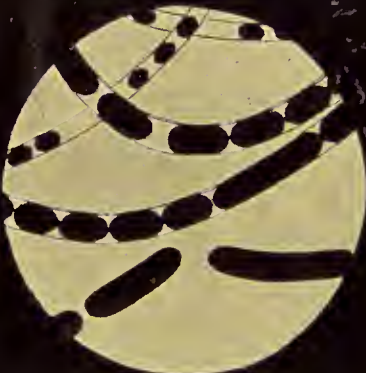
1



2



3



4



5



6



long exposure ; even here, however, antiseptics are useful, because, although they do not kill the spores, they so influence their vital energy as to prevent, or at least to retard, their transformation into the adult form.

In order that these organisms may live, certain conditions are necessary, viz., warmth, moisture, nourishment, and in many cases air. Just as the food and air on which we live, after having nourished us, leaves the body as urea, carbonic acid, etc., so, as the result of the vital activity of germs, the material on which they grow is destroyed, and in its place certain new substances are found. In some cases these new products are of great utility, e.g., alcohol and vinegar which arise from the fermentation of solutions of sugar by two different germs ; sometimes rich colouring matters are developed, yellow, orange, red, green, etc., whilst in other cases the results are of the nature of animal poisons and foul-smelling gases. It is the absorption of these chemical poisons that induces the symptoms of blood-poisoning.

In all germ diseases there are two opposing forces at work, the germs and the living body, and there are certain conditions which are favourable to the one or the other. Firstly, the germs may be present in large or small *quantity* and according as it is the one or the other, the resisting power of the body may or may not be equal to cope with the assaulting force. Again, if the *vitality* of the body is diminished or impaired, the facility with which it can throw off the poison is endangered, as for example in kidney disease ; under such conditions a smaller dose is able to work its deleterious effects. Thirdly, individual peculiarity is an important factor, some animals being absolutely unaffected by certain germ poisons.

These facts, which are the outcome of accurate research, correspond exactly to what is observed at the bedside, and help one to understand how it is that every lying-in woman

exposed to septic influences does not succumb to puerperal fever, and why some are exempt from any attack at all ; it also explains why those whose general health is vitiated by overwork, deficient food, overcrowding or other depressing influences should be specially liable to attacks of blood-poisoning.

Experiment has shewn, moreover, that tissues, whose vitality is impaired by *bruising* or otherwise, are especially liable to destructive inflammation from germ agency; this is an additional explanation of the fact that difficult and tedious first labours are more liable than others to be followed by septic infection. Conversely, one hopes that, with proper attention to antiseptic precautions, tissues that have been damaged by pressure may so far recover their tone as to avoid the formation of those exceedingly trying affections, the various fistulæ between the generative tract and the neighbouring viscera.

There are other ways, however, in which tissues may be damaged and rendered a prey to germ disease, viz., by irritating chemical substances, amongst which one must class the antiseptics in general use. In the early days of antiseptic treatment, needlessly strong solutions, *e.g.*, of chloride of zinc, were employed, with the result that septicæmia was developed rather than prevented. When a wound is healing—and is covered with those small pinkish elevations technically called granulations, the danger of septic absorption is considerably diminished ; if, then, by irritant antiseptics or rough handling, these granulations are injured, the chance of septic infection is thereby greatly increased. One other local condition which predisposes to septic trouble is the deficient drainage of any secretion pent up within the wound or retained within the womb ; such quickly sets up irritative fever, and this, if unrelieved, quickly passes over into a well-defined septic attack.

In concluding these remarks on the conditions favouring



germ-development, it is only necessary to add that inflammatory attacks, exposure to chill, and disordered digestion increase the susceptibility to septic trouble, and in our war against this insidious enemy, one must be aware of all the conditions which favour germ action, in order to guard against them. The most practical application, perhaps, of the last remarks will be a word of caution against exposing a patient, either at her confinement or during operation, to chill; a precaution which is sometimes rather neglected.

The four classes of germs already described do not, however, exhaust the number of lowly organisms associated with disease in the body, and with putrefactive changes outside it. The "moulds" are very widely distributed in the atmosphere, and are the most common cause of food spoiling when exposed to the air; such substances become "mouldy," we say. The varieties of mould are exceedingly numerous, but they all consist of threads of living tissue, which often branch like the boughs of a tree, and of spores, which are either developed in the thread, as in the case of the bacilli, to which reference has already been made, or else germinate from the branching filaments, much as a bud forms on the twig of a plant. In the plate opposite page 42, figures 3 and 5 represent the microscopical appearances of such moulds. Figure 3 was obtained from some thrush-like patches in the vagina of a patient, seen at the North-West London Hospital. Mr. Dunn, one of the house-surgeons, made a very excellent drawing of the specimen, a small part only of which is represented. In figure 5 is a more highly magnified representation of some mould, which developed on sterilised gelatine after a short exposure to the air of the room. In the tube experiments, about to be described, there are several cases of mould infection.

The following experiments are of much interest, as

illustrating common errors in nursing, and will well repay careful consideration. In July, 1889, seven flasks were freed from all living dust by heating them for some hours at a temperature of 300 F., having first plugged their mouths with cotton-wool. Into the flasks thus prepared, beef-tea was introduced, under a spray of carbolic acid, and, the cotton-wool caps having been replaced, they were all put on one side.

In the course of this experiment, two mistakes were made; in the first place a speck of dust got into the nozzle of the fine suction jet, so that the carbolic spray was represented only by a cloud of steam. This accident, though unfortunate for the experiments, will be useful in illustrating the precautions to be dwelt on later in describing the spray and its employment in aseptic surgery. The second mistake made was to allow the flasks to tilt, so that three or four of them had their cotton-wool caps wetted with the contained beef-tea.

Having made these two slips, it was not very remarkable that the contents of three only of the seven flasks remained good, but these three were sufficient to establish the truth already stated, viz., that animal fluids will not undergo putrefaction if germs are excluded. Never, till considering the cause of the failure of these flask experiments, did I clearly understand why an antiseptic dressing must be changed the instant that the discharge has soaked through; the reason plainly is that the discharge, as soon as it has reached the surface, furnishes a soil on which the atmospheric germs may find suitable nourishment, and along the tract of which, aided by the warmth of the body, they quickly extend inwards, till the wound itself is reached. For precisely the same reason, it is essential to wash the parts around the wound free from blood or other nutrient material, along the course of which germs might travel inwards.

The chromo-lithographic plate in the frontispiece represents the appearance presented by tubes of beef-tea or beef-jelly, which had been successfully sterilised in the manner already described, but were subsequently exposed to certain conditions of germ influence, each of which is distinctly illustrative of some error in obstetric nursing. The plate, therefore, is worthy of very earnest attention.

A. The fluid in the tube marked A was decanted from one of the flasks under a spray of carbolic acid, and remained perfectly clear some months afterwards.

B. Into this tube some of the beef-tea was decanted without the use of the spray. The tube itself had been sterilised with the same precaution as in the other cases, and for a few days all seemed as if it were going to be right. Then a spot or two of mould was discovered on the surface, and very soon the whole was converted into the condition seen in the plate.

As regards the remaining tubes, the beef-tea was gelatinised by the addition of some of the transparent gelatine used by photographers, and the experiments were conducted in every case under the carbolic spray, so as to avoid accidental contamination by atmospheric germs.

C. Into C a few drops from one of the flasks, which had already gone bad, were introduced, in order to show the very rapid way in which the gelatine would undergo change under such circumstances; in fact, as drawn in the plate, the clear jelly became quickly converted from above downwards into the reddish fluid there represented.

D. A mite of household sponge was introduced into this tube, and in a day or two a very vigorous colony of mould was seen to spread from the point where the sponge touched the jelly. As shown in the plate, the mould soon became so dense as to completely obscure the piece of sponge, whilst, extending downwards, the gelatine became liquefied into dark brown fluid.

E and F. Into these two tubes, scrapings from under the nail were introduced; in the one case (E) the little black specks were seen to eat their way into the jelly, followed by a comet-like tail of microbes, whilst in F a dense mass of mould developed, rapidly transforming the gelatine into the very dark brown fluid represented in the picture.

G. A mite of cotton-wool, which had been used to wipe the vulva, in the manner advised as a precaution previous to the use of the catheter (see page 86), was dropped into this tube, and almost immediately a mass of germs was observed to descend into the jelly, liquefying its substance, whilst the cotton-wool, owing to the air which it contained, was left floating on the surface.

H. This tube represents the result of inoculating the gelatine with a drop or two of urine passed by a patient suffering from chronic inflammation, the consequence of the use of impure catheters. It will be seen that the clear jelly is being converted from above downwards, into a dirty looking yellow fluid, whilst a whitish mass of germs lies on the surface of the jelly. A little lower a large bubble forms in the jelly, and this is quickly followed by the further liquefaction of its substance.

I and J. These two tubes are shewn to illustrate the necessity of antiseptic precautions in the nursing of infants. Into I a drop of sour milk was put under a carbolic spray. Very rapidly a coating of what appeared to be mould spread over the surface, whilst a mass of germs extended into the jelly.

J. This gelatine was inoculated with a scraping from the mouth of a child suffering from the "thrush." The young colonies of mould are seen to be of snowy whiteness, but as they enlarge they become greenish blue at the centre, extending at the circumference by a zone of white.

For a report of the microscopic appearances displayed



by these specimens, my hearty thanks are due to Dr. Wethered, who kindly undertook their examination. The tubes had been left rather too long to give the most satisfactory results, but, in addition to the moulds found in B, D, F, and J, Dr. Wethered detected bacilli in B, D, H, and I, micrococci also in H. The lessons taught by these simple experiments are as obvious as they are important.

1. The tube A demonstrates plainly that, in the absence of living organisms, it is possible to maintain an organic fluid in a perfectly fresh condition for a practically indefinite time.

2. If the carbolic acid spray is working imperfectly it is worse than useless, favouring, indeed, the introduction of aerial germs, and driving them, as it were, into the wound (see the flask experiments).

3. The failure of the greater number of the flask experiments shewed very strikingly the importance of preventing all organic continuity between the wound and the outside air, and gave ocular demonstration of the necessity of at once renewing the dressing as soon as any discharge has found its way to the surface.

4. A carbolic acid spray is sufficient to render the *air* free from active germs, but is not capable of disinfecting more solid germ-holding particles.

5. Comparatively short exposure to the atmosphere is sufficient to ensure a copious germ-harvest, owing to the ready implantation of such germs, or their spores, on any nutrient material to which they can gain access (Tube B).

6. Tube C teaches the important lesson that if ordinary air germs have already gained in numbers and activity by growth on suitable nourishment, they will, when placed in favourable conditions, shew extraordinary activity, and be proportionately dangerous.

7. Tube D. A sponge, though used for the purpose of cleansing, cannot on that account be supposed to be

germ free, but on the contrary, must, unless treated with the most absolute antiseptic precautions, be regarded as totally unsuitable for surgical or obstetric practice.

8. In E and F there is ocular demonstration of the danger ever lurking under the finger-nails. The teaching of this experiment cannot be laid too seriously to heart.

9. From the beautiful experiment in tube G, supported by H, one can understand how it is that the most rigid antiseptic precautions with regard to the catheter will be unavailing unless the external organs of generation are first freed from the secretion which is always present. Dr. Kaltenbach states, that since he has adopted the precaution of cleansing the vulva and the urethral orifice, he has seen no case of catarrh of the bladder, though previously even the most strenuous care of the catheter failed to banish this trouble.

10. The tubes I and J demonstrate the absolute necessity of such antiseptic care of the feeding-bottles, and of the mother's breast, as will exclude the possibility of atmospheric germs finding, in either case, a soil suitable for their development; in this way, not only will cracked nipples and abscess of the breast be banished, but most of the digestive troubles of infancy will likewise disappear.

There are certain *peculiarities* in the structure of the female organs of generation which render them very liable to septic infection.

The generative organs consist of the 'privates' or vulva externally; the womb and its appendages internally and the vagina, a muscular tube connecting the two. The vulva, both on the outer or skin, and on the mucous or inner surface, is very richly studded with glands, the secretion of which requires to be carefully washed away, first with soap and water and then with antiseptic solution before any operation is performed in its neighbourhood. With

regard to the vagina, there are three points to be borne in mind:—(1) The mucous membrane covering it is not a smooth surface, but is thrown into a number of ridges, with the result that in the depressions between these infective material very readily lodges. It is for this reason that douches often act very imperfectly in rendering the vagina aseptic; cotton-wool pads, or lint, soaked in antiseptics, act more efficiently, and dry antiseptic powders, sufficient to distend the vaginal canal, best of all. (2) The vagina is not a straight tube, but is curved in a twofold sense, the concavity below looking backwards, that above looking forwards. (3) Not only the vagina itself but also its immediate neighbourhood is very richly supplied with blood-vessels, so that any laceration of its substance is very liable to be followed by septic absorption.

Lying imbedded in the front wall of the vagina is the urethra, a canal about an inch and a half long which conducts the urine from the bladder. Its direction is that of the vagina. Every nurse engaged in obstetric practice should be able to pass the catheter without exposure of the patient to chill; the manner in which this is to be done and the necessary antiseptic precautions are detailed in a later chapter.

Between the orifice of the vagina and the anus is the structure called the perinæum which appears when seen in section as a triangular surface. The loss of its support, should it be torn through at child-birth and left unrepaired, often leads to various womb troubles. In length the perinæum is very variable, but is on an average about three-quarters of an inch from front to back. Every nurse and midwife should be on the look-out for rupture of this body, as it is very important to repair it immediately. The diagram opposite page 52 shews the relation of parts very well, and careful study of it will impress on the mind,

better than much verbal description, the necessity for care and the manner of observing it, in the administration of an enema after the operation for the repair of a ruptured perinæum; one can readily see how the nozzle of the syringe, if it were directed straight upwards, could be pushed through from the bowel into the vagina, at the spot marked by an \*. It will be clear too from the study of this diagram that in withdrawing pads such as those referred to above, the direction must not be merely downwards but downwards and forwards.

The womb is described as consisting of a body or fundus and a neck or cervix; the latter projects in part into the upper extremity of the front wall of the vagina whilst the body of the womb is not visible from this canal. In shape the womb is something like a flattened pear and is about three inches in length. The lining membrane of the neck is disposed in strongly marked ridges fancifully compared to the branches of a tree, but that of the body is quite smooth. Passing off from the upper angles of the womb, one on each side, are the oviducts or Fallopian tubes; these, together with the ovaries constitute the "uterine appendages." The oviduct as it leaves the womb is cord-like and its canal will only admit a strong bristle, but at its outer end it expands like a trumpet and is furnished with a fringe-like extremity; in length they vary somewhat, three or four inches being about the average, the right being frequently longer than the left. The ovaries, one on each side, lie below and behind the womb. The principal points to bear in mind with regard to the internal organs of generation are these:—

1. The rich supply of bloodvessels, as well as the abundance of those delicate canals in its structure called lymphatics, allows of septic matter gaining ready access to the general circulation. This congestive and absorbent





MEDIAN SECTION OF FEMALE PELVIS.

- |                           |                              |
|---------------------------|------------------------------|
| 0. Uterus, or Womb.       | 6. Fallopian Tube.           |
| 1. Vagina.                | 7. Ovary.                    |
| 2. Perinæum.              | 8. Cavity of the Peritoneum. |
| 3. Nympha, or Lesser Lip. | 9. Urethra.                  |
| 4. Rectum.                | 10. Symphysis Pubis.         |
| 5. Bladder.               | 11. Vertebrae, or Spine.     |



activity is greatly increased, not only after confinement, but also at the recurrent monthly periods.

2. The vagina through the womb and the Fallopian tubes is in direct communication with the peritoneal cavity, so that if fluid is forcibly injected into the vagina, as in giving an ordinary vaginal douche, it may enter the cavity of the womb and induce colic, or even traverse it and, passing along the Fallopian tubes, enter the peritoneum, giving rise to the immediate signs of shock and the subsequent development of peritonitis.

So far the non-parturient womb has alone been treated of, but after miscarriage, abortion or ordinary confinement, certain other factors are called into play which materially increase the dangers from septic infection.

To meet the requirements of the enlarging ovum the womb grows, not only in size but also in vascularity, *i.e.*, in richness in both the kinds of vessels already alluded to, whilst the lining membrane becomes greatly thickened, in order to form as it were a nest in which the egg may lie and from which it may receive the nourishment necessary for its development. In the early part of pregnancy this is affected by little fringe-like processes of the ovum dipping into the softened and thickened mucous membrane, and later by means of the placenta or 'after-birth.' It will, therefore, be readily understood that the removal of such a structure must entail the production of a surface very liable to absorb any noxious matter that may be presented to it. It will scarcely be necessary to repeat that the various fissures and lacerations which so frequently attend a first labour greatly increase the dangers of such absorption.

## Chapter IV.

ANTISEPTIC REMEDIES—CARBOLIC ACID—CARBOLIC ACID AS A CAUSTIC—PLAYFAIR'S PROBES—CARBOLIC ACID IN SOLUTION—CARBOLIC OIL AND CARBOLIZED VASELINE—THE SPRAY—CARBOLIZED CATGUT—A LISTERIAN DRESSING—PERCHLORIDE OF MERCURY OR CORROSIVE SUBLIMATE—ADVANTAGES AND DISADVANTAGES OF SUBLIMATE AND CARBOLIC ACID COMPARED—CONTRA-INDICATIONS TO THE USE OF THE PERCHLORIDE—SYMPTOMS OF CARBOLIC AND MERCURIC INTOXICATION AND THE RESPECTIVE TREATMENT—THE DOUBLE CYANIDE OF MERCURY AND ZINC AS A DRESSING—IODIC HYDRARG—ACCIDENTAL POISONING BY CARBOLIC ACID OR SUBLIMATE SOLUTION WITH THE TREATMENT—BORACIC ACID, AS POWDER, IN SOLUTION, AND AS DRESSINGS—IODOFORM, AS POWDER, EMULSION, AND DRESSINGS—INTOXICATION BY IODOFORM AND THE TREATMENT—SOLUTION OF CHLORIDE OF LIME—LIQUOR SODÆ CHLORINATÆ—CONDY'S FLUID—SULPHUROUS ACID—BROMINE AND "BROMIDINE"—THE CHEMICAL INCOMPATIBILITY OF SOME ANTISEPTICS AND THEIR DETERIORATION WHEN USED WITH SOAP.

THE present chapter will be devoted to the consideration of antiseptic remedies and the form in which they are best applied to maintain a condition of asepsis. Of such remedies the one in most general employ is carbolic acid, which was first used for this purpose by Lemaire, who, in 1863, published a pamphlet advocating its use as a surgical dressing. He did not, it appears, in any way aim at keeping a wound aseptic in the sense we now understand it. Shortly afterwards, Sir Joseph Lister introduced the same substance, no longer on empirical grounds, but as a part of a great system, the object of which is the exclusion from a wound of the causes of putrefaction.

*Carbolic acid* exists in commerce in different degrees of purity. Mr. Watson Cheyne recommends that supplied



by Boodler and Bickerdike, Church, Lancashire, under the name of "Absolute Phenol." Calvert's carbolic acid, No. 2, is also suitable for operation purposes and is of the same purity as that recommended in the "British Pharmacopœia."

The undiluted acid is used only as a caustic, nine parts of the acid to one of glycerine, making an application very frequently used on Playfair's probes. To prepare such a probe well is a very useful accomplishment for an obstetric nurse; a piece of cottonwool drawn out into a light tape-like strip is held in the fingers of the left hand, and the tip of the probe having been first enveloped, the remainder is evenly covered by revolving the probe on its own axis, thus winding on the wool tape. A probe thus prepared should present a perfectly even surface, so as to allow of its easy introduction into the womb. When the wool is to be cleaned off, the end next the handle is caught in a pair of dressing forceps, and the probe revolved in an opposite direction, so that the wool is unwound, the part at the top of the probe generally requiring to be torn off. If the wool is wound too loosely round the probe, it is liable, on the withdrawal of the latter, to be left within the cavity of the womb; if it is unevenly wound, it may, perhaps, be impossible to pass the probe at all, or the point enters the uterine cavity, leaving the wool in a bunch against the handle.

Carbolic acid is generally kept for use as a solution of 1 in 20, *i.e.*, one part of acid dissolved in nineteen parts of water; this can be easily diluted as occasion may require. One should never trust to making a solution of carbolic acid on the spot, as the aid of heat is necessary to prepare it properly. Sometimes a mistake such as the following is made:—For convenience of carriage the acid is brought to an operation either in the pure state or mixed with an

equal bulk of water, in which condition, on being shaken, it forms, not a solution but an emulsion or milky fluid, consisting of small drops of acid suspended but not dissolved in the water; these drops of pure acid are not only caustic to the hands of the operator, but as they cling to the instruments are very likely to hinder union by first intention. The solution must, therefore, be prepared beforehand of the strength indicated, and kept in stoppered bottles ready for use. Such a solution should be perfectly colourless like water; if it is at all milky or if globules of oily material are seen floating on its surface, then the solution is not sufficiently pure for operation purposes.

It has been pointed out to me that nine parts of carbolic acid will combine even in the cold, though more readily by aid of heat, with one part of water to form a solution; on the addition of water to this, the oily globules of carbolic acid separate, but on further dilution to the strength of 1 in 20 a perfect solution results.

One part of carbolic acid dissolved in nineteen of olive oil was at one time very much used for lubricating catheters, but it has been experimentally shewn that the affinity of the oil for the acid is so great as to render the latter inert as an antiseptic, so that it seems preferable to use a vaseline ointment of the same strength.

When Sir Joseph Lister first enunciated the principles and practice of antiseptics, the detail which appealed most strongly both to the lay and to the professional mind was the employment of the *carbolic acid spray* for the purpose of purifying the environment of the patient. This was at first worked by the hand or by the foot, but as both methods were exceedingly fatiguing they have given place to steam. The steam-spray consists of a copper boiler supported over a spirit lamp, the heat from which is capable of adjustment. From a boiler, which must be provided with a

safety-valve, passes a horizontal tube ending in a fine jet, and this is set at an angle to another fine jet attached to a tube dipping into a solution of carbolic acid. When steam issues from the one jet, it draws up by suction through the other a supply of carbolic acid which is instantly dispersed as a spray.

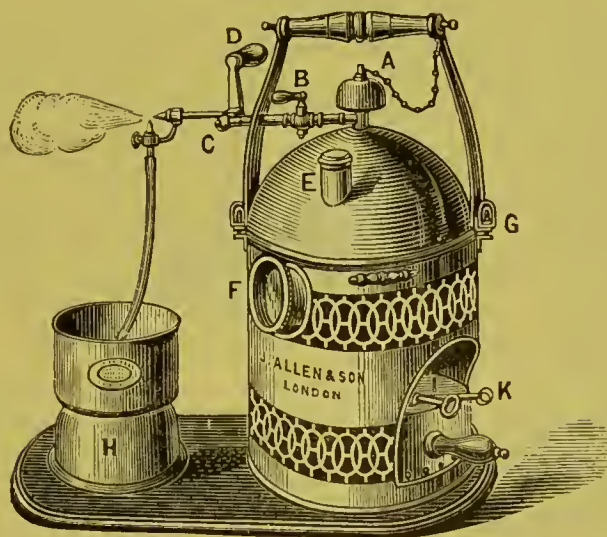


Fig. 1.

The above represents a steam-spray manufactured by Messrs. Allen and Son from suggestions made by Mr. Robert W. Parker and seems to be the best and most reliable in use. The safety-valve A is a nicely adjusted weight of lead that directs the escaping steam downwards and not into the face of the assistants. The lever D allows of the direction of the steam-jet being graduated at pleasure and the position of the handle is a very great improvement saving the liability to strain of the wrist which was no imaginary danger in the older form of spray. Messrs. Allen and Son also supply a very convenient form of table for this apparatus, made at the suggestion of Mr. B. Hill (fig. 2). It is mounted on castors, and at the lower part between the legs is a tray for holding bottles, etc., whilst above is a tray into which the stand of the instru-

ment is securely fixed. The tray can be raised or lowered at pleasure and turned in any direction horizontally.

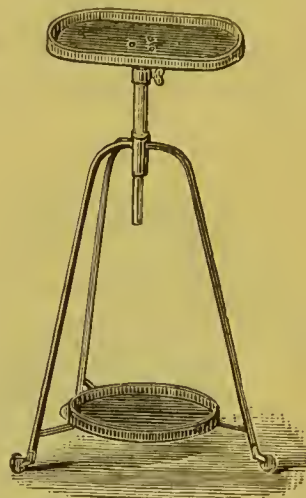


Fig. 2.

There are a few points in the practical working of the spray which it is well to bear in mind. First, care must be taken that the lamp is not too full of spirit, not more indeed than two-thirds at the outside, otherwise the heat of the lamp causes the spirit to expand and after the commencement, perhaps, of the operation, much to everyone's embarrassment, a general flare-up results. The boiler should not be too full, or upon turning on the spray a jet of boiling water rather than of steam will issue. The apparatus should always be tried for a few minutes before an operation to see that it is in good working order. During its performance, care must be taken to see that the carbolic solution does not become exhausted or the spray will act very much as was the case in the flask experiments detailed on page 46. Should it become necessary to renew the water in the boiler, or if the spray acts inefficiently from any other cause, the wound should in the meantime be covered up with lint wrung out of carbolic lotion. If a particle of dust gets into the orifice of the nozzle, the carbolic acid in the spray will stop whilst the



steam goes on ; to prevent this, the end of the tube in the carbolic acid lotion should be provided with a mite of sponge that may act as a filter. The difference between the sound of a spray which is acting efficiently and one that is simply a jet of steam is so decided that every nurse should at once be able to recognise it. The strength of the lotion used in the reservoir is 1 in 20 ; this becomes diluted by the steam to about 1 to 30, or 1 in 35. There are certain drawbacks in the use of the spray which have caused it to go out of fashion ; it is now no longer regarded as essential to the antiseptic method of treatment, but what one would insist on is this, that, if used at all, it should be used efficiently.

Messrs. Allen and Son supply the following directions for the use of their steam-spray :—

“Put the measurefull of Methylated Spirit, or Spirits of Wine, into the Lamp, by removing the cap screw on the top of the handle. Fill the Boiler with boiling water at and up to the level of the filling screw on side of same, screw down the cap tightly, and then light the lamp. Place the bottle, or any glass tumbler, containing the antiseptic solution in the metal receiver fixed on stand in front of the apparatus. When the steam is issuing well out of the jet, the suction jet may be adjusted and fixed in position by the set screw in front. The wick should stand about a quarter of an inch above the level of the wick holder.

If the boiler is always filled up to the level of the filling screw before using, it will never then become dry, and cannot get burnt or damaged, as the spirit in the lamp would be exhausted before the water ; whenever the lamp is filled, the boiler should be refilled.

If much steam escapes from safety-valve, and there is no pressure to cause suction at the jet, it will at once show that the jet is choked, and the lamp should be withdrawn to let down steam, and the jet unscrewed and cleared, by blowing or passing a fine needle through same

Much time will often be saved by examining the jet to see if perfectly free before commencing to work the apparatus.

If the spray is working well and much steam escapes from safety-valve (unless out of order) it shows more is being made than required, and the flame of lamp should be reduced by pushing the wick further down the tube.”

To this one might add a caution against breaking the point of the needle in the jet.

*Carbolised catgut* is used for tying bleeding vessels (ligatures), or as material for sewing the wound (sutures). Chromic catgut is now more generally used for the latter purpose. Catgut should either be kept dry and soaked for an hour preceding the operation in carbolic lotion, 1 in 20, or else in bottles of carbolic oil, in which case it does not require such long immersion preparatory to an operation.

*Protective* is a preparation of oiled-silk; it should be of such a size that, while just large enough to protect the wound from the irritant effect of the carbolic gauze, it is not so large as to shut in the discharge.

*Carbolised gauze* is a dressing made by soaking fine unbleached tarlatan in a mixture of carbolic acid, resin, and paraffin, and is used either as a folded dressing, loose gauze, bandage, or shreds; these last may be made of the small cuttings from other dressings, and form an excellent material for soaking up discharge. Carbolised gauze should always be kept in a tightly fitting tin box.

The *mackintosh* used in a Listerian dressing is ordinary thin hatter's mackintosh; previous to use it should be dipped into a solution of carbolic lotion; the gauze dressing is generally 8-ply, and the mackintosh should be inserted between the seventh and outermost folds, taking care that the glazed surface is towards the wound.

It was supposed formerly that a 1 in 20 solution of carbolic acid instantly destroyed all germs exposed to its influence, but since the discovery of spores and their remarkable vitality, great doubt has been expressed as to the efficiency of carbolic acid, excepting so far as it may hinder the germination of spores into the mature organisms. To nearly all adult germs, however, a solution of 1 in 20 carbolic acid is very rapidly fatal.

On the other hand, Koch has shewn that in corrosive sublimate we possess an antiseptic which, even in such weak solution as 1 in 5,000, is almost at once fatal to spore-life. Since the publication of these results, solution of the sublimate has, to a large degree, replaced carbolic acid solutions.

*Corrosive Sublimate, or Perchloride of Mercury*, is a heavy crystalline body, and is exceedingly poisonous. For operation purposes it is best kept in solutions of the strength of 1 in 500 of water; its solubility is greatly facilitated by the addition of an equal quantity of sal-ammoniac, and its stability increased if a small proportion of free acid, such as tartaric, is added to the solution. To prepare a Winchester quart (eighty ounces) of the solution, 1 in 1,000, it would be necessary to dissolve a powder containing 75 grains each of sal-ammoniac and corrosive sublimate, with half-an-ounce of tartaric acid in the bottle full of water. If the acid is not used, the alkalinity of the water leads to the decomposition of the perchloride, with a consequent deterioration of its efficiency, a drawback which is intensified by the addition of the sal-ammoniac. Perchloride may be conveniently carried about, as recommended by Dr. Cullingworth, in the form of powders, the composition of which is as follows:—Mercury perchloride, 10 grains; cochineal, 1 grain; tartaric acid, 49 grains. Such a powder, dissolved in a pint of water, forms a solution of the strength, 1 in 1,000; the object of the colouring matter is to prevent the solution being mistaken for plain water.

Corrosive sublimate is also used as a *gauze*, and in combination with wood-wool as an absorbent dressing, the disadvantage of which lies in the fact that the liability to an excessive absorption of the drug is greatly increased by such a method of employment.

In comparing the respective merits and demerits of

these rival antiseptics, the following points must be noted :—

1. Perchloride, in suitable strength, is less irritating to the hands of the operator as well as to the wound, carbolic lotion being apt to benumb the hands and so render touch less delicate. The constant use of perchloride, however, is liable to produce a grey discolouration of the nails, attended by painful eczema. Eczema is likewise very readily produced under a perchloride dressing, and is a source of danger, owing to the increased facility with which the drug is absorbed.

2. Perchloride is very readily soluble in hot water, especially if assisted by the addition of sal-ammoniac, or the presence of free acid, such as tartaric.

3. The perchloride being without colour and odour, does not stain or offend the sense of smell, advantages which are not without compensating disadvantages, seeing that the solution may readily be mistaken for plain water ; this is obviated by the addition of a little colouring matter such as carmine or indigo.

4. Corrosive sublimate is not only itself without odour, but it deodorizes discharges to a remarkable extent, at the same time diminishing their amount.

5. It is less volatile than carbolic acid ; its solutions should, therefore, remain more constant.

6. Perchloride is very readily carried in a small bulk and is much cheaper than carbolic acid ; a Winchester quart of the latter, 1 in 20, costs 3s., whilst the same amount of perchloride solution, 1 in 1,000, costs but 2d.

As a set-off against these advantages, certain disadvantages must be remembered :

1. Perchloride of mercury is more liable to be followed by symptoms of poisoning than is carbolic acid, and this is especially true of the lying-in woman. One reason, no doubt, for this is, that during the latter part of pregnancy,



owing to the pressure exercised by the enlarging womb, the functions of the kidneys are often materially interfered with, and after the birth of the child, the conditions then existing, as was explained in a former chapter, are an additional strain on these organs; hence it is not hard to understand that, dependent to a very great extent on the kidneys for the elimination of mercury, the lying-in woman with her excretory organs already enfeebled and overtaxed, should very readily be saturated with the remedy. After operations the danger of undue absorption is greatly increased if sublimate dressings are used, as these tend to develop a local eczema that constitutes a very absorbent surface.

2. Although the antiseptic power of perchloride is between 500 and 1,000 times as great as carbolic acid, a solution of the former has this great comparative disadvantage, viz., that it coagulates albumen very much more readily than carbolic acid. In this way, not only is the strength of the solution greatly impaired, but the deposit so formed hinders the solution from getting to the secreting surface. This is a great drawback. It has recently been shewn that a solution of perchloride, 1 to 500, added to an equal bulk of the expectoration of a consumptive patient failed even after twenty-four hours to kill the tubercle bacillus, whilst a watery solution of carbolic acid, 1 in 20, added in the same proportion, completely disinfected it after the same exposure.

3. The sublimate cannot be used for metallic instruments, as a deposit of mercury takes place under such circumstances, and this not only takes off the point from needles and the edge from knives, but leads to their subsequent rusting. Few things are more annoying than to find that instruments have been laid, for the half-hour preceding an operation, in a solution of perchloride of mercury.

4. Unless free acid is added to the perchloride solution, the alkalinity of most waters leads to decomposition and consequent loss of strength.

5. A solution of perchloride administered in a douche requires so much care and skill, that it can only be entrusted to those nurses who have had unusual experience or are gifted with great discretion.

With regard to what may be called the personal factor in the selection of this or that antiseptic for this or that case, it appears that children are particularly susceptible to carbolic acid, and that the subjects of kidney disease are especially liable to poisonous effects from the employment of the perchloride solution. With regard to the condition known as anæmia or bloodlessness, it appears that the susceptibility, both to carbolic acid and to perchloride, is thereby increased. Every nurse should be aware of the symptoms which indicate that an undue absorption of either of these antiseptics is taking place.

*Carbolic acid intoxication.* In patients' urine, after it has stood some time, it is not unusual, where carbolic acid has been employed in any large amount, to find that a distinctly brownish-green hue is developed; this itself is an indication that carbolic acid has been absorbed to a considerable extent, and is being excreted. The urine in these cases, not infrequently, contains albumen. One or more of the following symptoms are also present:—Sickness or nausea, with increased flow of saliva, embarrassed breathing and an aspect of anxiety. Fever may, or may not, be present, but debility, even to the degree of collapse, is sure to supervene. Should any of these symptoms arise, in the course of any case, it is right at once to send word to the doctor having the care of the patient, as it will be necessary to change the dressings of carbolic acid for those of iodoform, eucalyptus, or salicylic acid. Stimulation by external friction, and the

administration of brandy or ether, will probably be necessary.

The symptoms above narrated bear a suggestive family likeness to those due to septic poisoning, and doubtless many cases ascribed to carbolic poisoning might, with equal or greater truth, be laid to the charge of sepsis, arising from the imperfect application of antiseptic principles.

*Sublimate Intoxication.* Whenever a patient is being treated with injections of perchloride solution, or is wearing dressings impregnated with this material, one should be constantly on the look-out for the supervention of a certain train of symptoms. First and foremost, the condition of the mouth and bowels must be daily noted; any tenderness or sponginess of the gums, or increase in the amount of the saliva, as well as any looseness of the bowels, calls for an immediate discontinuance of the drug. Together with these symptoms, one or more of the following are generally present: headache, giddiness, pains in the lower abdomen, lowering of temperature, sweats and general prostration, with urine often albuminous, and sometimes containing blood. Feverishness, with the development of a red rash, has occasionally accompanied the mercurial intoxication. The most suitable treatment appears to be the administration of opium, the application of soothing compresses or poultices to the abdomen, and a diet of rice-milk. It need scarcely be said that the withdrawal of the further use of mercury is the first essential.

Wherever a patient is anæmic, or is passing urine of a low specific gravity, or has other symptoms of kidney disease, or is known to have been taking a course of mercury, then especial care must be taken in the employment of the sublimate lotion, or, better still, an antiseptic of a safer character should be substituted.

Reference has been repeatedly made to certain defects in corrosive sublimate as the ideal antiseptic, viz., that, as dressings, it is very liable to create eczema, and that its antiseptic value is much impaired by combination with the albumen of the blood and discharges. To meet these two difficulties, Sir Joseph Lister has recently introduced to the notice of the profession a combination of the *Cyanides of Mercury and Zinc*, for which he claims the following advantages:—It is a reliable antiseptic, it is completely unirritating, and, as it requires about 3,000 parts of blood serum for its solution, it is not readily washed out of dressings. Thus introduced by the father of modern antiseptics, it cannot fail to meet with a favourable reception and become a permanent addition to our antiseptic resources. Sir Joseph describes it as the most satisfactory dressing with which he has yet met.

There is a salt of mercury and iodine recently introduced under the name of *Iodic-Hydrarg*, which is likely to be of great utility. It is claimed for this preparation that it does not coagulate albumen, and that, though less poisonous to patients than the perchloride, it is twice as effectual a germicide. Should these claims be supported by extended experience, a great advance will have been made.

It is well to know how to proceed in a case of accidental poisoning. *Carbolic acid poisoning*. If this acid or its solution has been swallowed, the first thing to do is to get rid of the poison by the administration of an emetic, such as twenty grains of sulphate of zinc, dissolved in a wine-glass of water, or by copious draughts of salt and water; or the stomach should be washed out with the stomach-pump. Having evacuated the poison as far as possible, the most efficient antidote is said to be the saccharate of lime. This is prepared by dissolving 16 parts of sugar in 40 of water, and adding 5 parts of caustic



lime ; after three days' digestion, the mixture is evaporated. It should be given in an excess of water. Supposing such a lime preparation to be unattainable, probably the best thing after emptying the stomach would be to administer olive oil as copiously as possible. Internal stimulation is also called for, enemata of ether and beef-tea being very suitable, whilst the warmth of the body should be promoted by hot blankets, etc.

If solution of *perchloride of mercury* has been swallowed, the white of egg must be given very freely, in order to form a precipitate with the metallic salt ; the stomach should then be washed out, to remove the deposit, and soothing drinks, such as linseed tea, given. Poultices are to be applied over the stomach. Opium or morphia constitute the principal medicinal resources.

With the progress of knowledge, it will probably be found that, just as special germs are associated with certain diseases, so there are certain antiseptics which are specially antagonistic to particular germs ; it becomes, then, the object of one's study to learn the most suitable antiseptic for each individual case.

*Boracic Acid* seems to be of special use in combatting the ordinary germs of putrefaction, and in this way is of immense service in cases of catarrh of the bladder, resulting from the use of imperfectly cleansed catheters ; according to Pasteur it is "par excellence," the antiseptic most antagonistic to the bacteria of putrid urine.

Boracic acid is a whitish crystalline powder with a curious velvety feeling ; it is soluble in 25 or 30 parts of cold water, and to a larger extent in hot water ; it is non-poisonous. One ounce dissolved in a quart of warm water makes a very suitable injection for washing out the bladder. A weaker solution of four or five grains to the ounce is a very suitable wash for a baby's eyes where any irritation arises in them soon after birth. As a dry powder, it is an

excellent application in leucorrhœa. Boracic acid is further employed in the form of lint or wool, prepared by soaking one or the other in a saturated solution and then drying them. It is usual to colour the boracic lotion, lint, etc., with a faint tint of indigo, in order to distinguish them from the carbolic and other colourless lotions and fabrics.

*Salicylic acid* is a non-poisonous antiseptic, but is of comparatively little power; it is used as wool to cover other dressings.

*Iodoform* is an antiseptic, regarding the actual merits of which very different opinions have been formed by those qualified to judge; some have thought it an application of great value in excluding germs from the peritoneum, others have thought it a very dangerous and unreliable remedy in such cases; to me it seems an antiseptic of great value, especially suitable for application to the vagina and its neighbourhood. A distinct disadvantage, however, is its odour, which, to most people, is extremely disagreeable, and in some cases has appeared to favour nausea and other stomach disturbance, Iodoform is soluble in ether, and may be used as an emulsion with gum-tragacanth and water for washing out the bladder; most commonly, however, it is employed, either as gauze or wool, prepared by soaking one or the other in an ethereal solution of the drug, or else as a powder for dusting on wounds. Mr. Treves makes a very neat and efficient iodoform-dredger from a small, wide-necked bottle, the mouth of which is covered with a piece of gauze kept in position by an indiarubber ring embracing the neck; when not in use the glass stopper is replaced and bound in position by the gauze and indiarubber. Iodoform is also made up in the form of bougies so as readily to be introduced into the uterus after any operation, or in cases of retained placental fragments.

Iodoform owes its antiseptic properties to the iodine which it slowly gives up in contact with the warm living tissues, and it is as iodine that its presence is detected in the urine ; it has a soothing, benumbing effect on the wound which is naturally an additional merit.

*Iodoform intoxication.* It sometimes happens that an excess of iodoform is absorbed by the system and produces symptoms of poisoning. In mild cases these consist of sleeplessness, headache and loss of memory, whilst in severe cases maniacal attacks, hallucinations or melancholia may develop. These disagreeable effects are said to be diminished by the hourly administration of ten grains of bicarbonate of potash.

*Iodine* as solution, consisting of one drachm of the tincture in a pint of water, is a valuable antiseptic. Its volatility, so far from being a drawback as an application to the womb and the vagina, is a positive advantage, seeing that it allows of all parts coming under the influence of the antiseptic, even those which may have escaped actual contact with the solution. It cannot, however, be used for instruments, as it would speedily rust them, but sponges can be immersed in such a solution with great advantage.

*Solution of Chloride of Lime* is of great historic interest as being the antiseptic which Semmelweiss introduced into the Vienna clinique with such marvellous results ; it may consequently be regarded as the original antiseptic, and although rarely used now in surgery, chloride of lime still plays an important role in domestic sanitation. Its value depends on the slow evolution of chlorine gas. A solution of chlorinated soda is a very useful application ; the odour is perhaps not the most agreeable, but compared to many of the foul smells that cling to the hands after touching septic matter, it is perfectly delightful. A teaspoonful of the *Liquor Sodæ Chlorinatæ* of the British Pharmacopœia to a pint of

water can be used as a vaginal injection with great advantage where there is much fœtor of the discharge. If to each ounce of this solution of chlorinated soda is added four grains of permanganate of potash, a solution of very great usefulness results.

The antiseptic in most common use as a vaginal injection is *Condy's fluid*; the active ingredient in this is *Permanganate of Potash* in the proportion of about eight grains to the ounce of water.

A suitable injection is made by adding a teaspoonful of such a solution to a pint of water. The advantages attending its use are, that it is inexpensive, non-poisonous and slightly astringent to the mucous membrane and refreshing to the patient. Its disadvantages are, that it is immediately destroyed by all organic matter, even by the vaseline or oil used to lubricate the vaginal tube, as well as by the secretion with which it meets; for this reason a copious injection is absolutely necessary and must be continued till the fluid returns as clear and pink as when injected. Owing to this action on organic matter, a brown stain of manganese is produced, if Condyl's fluid drops upon linen; it is the same brown deposit which clings to a pessary worn whilst such injections are being used. For a similar reason, Condyl is unsuitable for instruments, owing to its rapid decomposition and the consequent disfigurement of the metallic surfaces. Its use, therefore, in obstetrics is practically limited to the vaginal douche; it is simple and harmless, but not altogether reliable.

The old-fashioned way of laying saucers about the room filled with Condyl's fluid was justly ridiculed by Dr. Cullingworth in his presidential address to the British Medical Association in 1889. The only way in which it could be of service is by providing the germs with a lake in which they might, if so minded, commit suicide.



Being non-volatile it is practically useless for ærial disinfection.

*Sanitas*, a patent antiseptic derived from turpentine, has an agreeable odour and is useful either as a vaginal douche or for volatilising in the room.

*Sulphurous acid gas* dissolved in water is a non-poisonous antiseptic and is sometimes used as a vaginal injection or as a lotion to wounds—one part of the acid of the Pharmacopœia mixed with three or four parts of water. The gas derived from burning sulphur is the means of disinfection most commonly in use for purifying rooms after infectious disease, or preparatory to an operation.

New antiseptics, such as *Salufer*, are constantly being introduced, but each must stand the test of extended experience before its real value can be ascertained. The substitution of *Salufer* for corrosive sublimate, as a vaginal and uterine douche, was attended by the outbreak of puerperal fever in the wards of a lying-in hospital, where for the previous three years such mischief had been virtually banished.

The *volatile oils* such as thymol, eucalyptol and turpentine all possess antiseptic properties in some degree, but are scarcely of sufficient power to merit extended notice in a work like the present.

The value of *Bromine* as a disinfectant has long been recognized; it belongs to the same group as iodine and chlorine. The difficulty till recently has been to exhibit it in a convenient form. This has now been accomplished in a patent compound called 'Bromidine' which is of the greatest value for aerial disinfection. It is a whitish powder which on the addition of water gives off fumes of bromine. It must be remembered that all the members of this group, bromine, iodine, and chlorine, affect metallic surfaces, so that articles exposed to their influence very quickly tarnish and may actually be spoilt.

Before leaving the subject of antiseptic remedies, it will be well to point out that some antiseptics are chemically incompatible with others, so that the mixture of such results in the formation of a new substance which may be quite valueless as an antiseptic. The most common example is the admixture of Condy's fluid with carbolic acid. If solutions of these be added the one to the other, a dirty looking deposit resulting from the decomposition of the permanganate is precipitated. Though there are some antiseptics which do not thus destroy the efficacy the one of the other (it is possible that perchloride and carbolic, when used in succession, actually supplement the utility the one of the other), still the only safe rule to follow is to maintain the utmost simplicity in the choice of such solutions.

The energy of all antiseptics is probably impaired by admixture with soap, so that it is highly unscientific to wash with soap in an antiseptic fluid; the proper course to pursue is first to scrub the hands well with soap and water, and then, having rinsed off the soap, to thoroughly wash them in the antiseptic lotion.

## Chapter V.

ANTISEPTIC PRECAUTIONS COMMON ALIKE TO OPERATIVE GYNÆCOLOGY AND MIDWIFERY—THE HOUSE AND ITS SANITATION—THE ROOM AND ITS VENTILATION—DISINFECTION—THE BED—PERSONAL HYGIENE OF THE ATTENDANTS ON THE PATIENT—THE CLOTHING—THE HANDS AND NAILS—SPONGES, SUTURES, AND INSTRUMENTS—THE ANTISEPTIC DOUCHE—THE CATHETER—THE ENEMA—OBSERVATION AND RECORD.

THE four preceding chapters have been concerned with the fundamental knowledge on which alone can be based a due appreciation of the principles of antiseptics as a preparation for their intelligent application in practice. In this and the concluding chapters, we have to consider those points of detail, by attention to which we may hope to attain success. There are certain applications of antiseptics which are common alike to the practice of midwifery and gynæcology, whilst certain others are, more or less, special to one or the other. In this chapter we are to consider what must be regarded as the essentials of antiseptics in their relation to obstetric nursing, common alike, therefore, to gynæcology, and midwifery.

The *house* and its surroundings, where a patient is expecting her confinement, or where one proposes to perform an operation, must always be carefully considered; circumstances allowing, one would not choose a low-lying, damp locality as the one most suitable for the purpose. It is of primary importance to ascertain that the *sanitation of the house* is perfect; that there is no communication between the over-flow pipe of the cistern and the drain, that the waste-pipe of the bath and of the sink is properly

trapped and ventilated, and that no rain-water pipe communicating with a drain acts as a ventilating shaft close to the patient's windows. The closets should be daily flushed with water, and the windows on the staircases kept constantly opened, in order that the air in the passages and on the staircases may be fresh. Fresh air is, after all, the best disinfectant, and it must not be forgotten, that the patient's room is, at least in part, ventilated from the rest of the house.

The *room* should be furnished as simply as possible. As far as practicable, everything that can harbour dust should be removed, as for example, all unnecessary carpets, curtains, and bed-hangings; strips of carpet, sufficient to deaden sound and easily removable to be shaken, are the most suitable.

To *disinfect a room* with sulphur is such a simple process that it should be done whenever possible. The simplest plan is as follows :—The windows and the register of the fireplace having been closed, in the middle of the room a slop-pail full of water is placed, across which is laid a pair of tongs supporting a saucepan-lid or other similar iron plate; on this the sulphur, broken up into small pieces, is laid. A quarter of a pound suffices for an ordinary-sized room. The sulphur is lighted by pouring a little methylated spirit over it, which is then ignited; the door is immediately closed and the crevices pasted up in order to shut in, as far as possible, the fumes of the sulphurous acid gas arising from the burning sulphur. In from twelve to twenty-four hours the door is cautiously opened, and the room thoroughly aired through the open windows.

The room, when occupied, should be constantly ventilated by having the upper window sash a little down, or better, by having a board fitted to the lower part of the window, so that the lower sash can be somewhat raised



without any direct current of air chilling the patient ; this arrangement admits a free up-draught towards the ceiling through the space between the two sashes. *Pure air* is the first consideration in the maintenance of asepticism.

The necessary *dusting* in the patient's room is best done, both as regards the floor and the furniture, by wiping them over with cloths wrung out of weak carbolic lotion, a quarter of a pint of carbolic acid (Calvert's No. 5) to a gallon of water.

The *bed* should be placed in a position out of draught, but not in a corner, as it is necessary that easy access should be possible to both sides ; this is essential, not only for the nurse's convenience, but also to permit of free play of air about the bed, and for this reason no vallances are allowable.

In the *attendants*, whether medical or nursing, personal cleanliness of the most absolute character is essential. Clothes worn whilst in attendance on a case of septic or zymotic disease must not be taken into the lying-in room until they have been thoroughly disinfected ; the danger attending the use of cuffs must never be forgotten. The most important factor, however, in the matter of personal asepsis is the care of the nails and the hands. Emmet, the great American gynæcologist, once said, "Many a woman's death-warrant has been carried under the finger-nails of her physician." Short nails are an essential.

Dipping the fingers into an antiseptic solution, as one constantly observes even now as an apology for antiseptic precautions, is plainly a farce ; five minutes spent in the thorough cleansing of the hands is five minutes well spent, and to wash the hands thoroughly they must be washed scientifically. First, they must be thoroughly scrubbed with soap and water and a nail-brush ; or, seeing that the frequent use of the nail-brush is apt to tear the folds of skin about the nails, it is better to fill them with soap by

scratching and then let the nails of the one hand clean the nails of the other, finishing with a moderate use of the nail-brush. Bailey's india-rubber brushes are very useful for scrubbing the hands. The soap must then be rinsed from the hands in fresh water, and they must afterwards be washed in the antiseptic solution, taking the same care to get it well under the nails by raising them with the nails of the opposite hand.

The rationale of this procedure is as follows:—The soap and water removes the dirt and grease, which would otherwise prevent the action of the antiseptic, and the hands are rinsed free from soap before immersion in the antiseptic, because the soap and the antiseptic are more or less chemically incompatible. It is for this reason that the antiseptic should never, as is too generally done, be put into the water in which the hands are to be washed with soap.

A moment's reflection will show that the perfunctory washing of the hands can only lead to self-deception and disappointment. The facility with which septic matter may be stowed away under the nails must be obvious to all, and it is only necessary to look at the palm of the hands and palmar surface of the fingers under a magnifying glass to understand how the countless depressions corresponding to the orifices of the sweat-glands might harbour an indefinite amount of septic matter. Reference to the test-tube experiment (frontispiece) will illustrate what is meant.

No nurse who is herself suffering from any offensive discharge of any kind, e.g., from the nose, as in the case of Dr. R. (see page 26), should undertake either a maternity or an operation case; a festering finger or a whitlow is an absolute bar to engaging in such practice. On one occasion, twice during an operation, sponges were handed to me with hair on them; a little care on the nurse's part would have obviated such an unpleasantness.

*Sponges.* To obtain and to keep *sponges* free from suspicion of septic taint is one of the most difficult, as it is one of the most essential points in the successful application of antiseptic principles.

Sponges, as bought at the merchant's, contain large quantities of sand and chalky matter, and from this they must be cleansed before they are fit for surgical work. To effect this, they must be soaked and squeezed in water acidulated with hydrochloric acid (spirits of salt), about half an ounce of pure acid to a gallon of water; this must be persevered in, soaking and squeezing, soaking and squeezing, time after time, in water after water, till the sponges are quite free from grit, and no deposit is left at the bottom of the vessel. They must then be thoroughly washed in plain water, and, after drying, be kept in the driest place in the house (for example, hanging from the kitchen ceiling), or they may be kept till required in a covered vessel of carbolic acid solution, 1 in 20.

When sponges are used at an operation, the carbolic acid, 1 in 40, or the solution of perchloride, 1 in 1,000, causes the blood to coagulate in the substance of the sponge, so that it is wrong in principle to dip sponges, just as they are returned from the surgeon, in antiseptic solutions; the right course to follow is to wash them thoroughly in abundance of tepid water, and then to dip them in the antiseptic, finally rinsing them in hot water, just as they are handed back in a small sponge basin to the assistant. It is also of very great importance to handle sponges as little as possible after they are taken out of the antiseptic.

At the end of the operation, one of two courses may be followed, with the object of getting rid of the blood entangled in the meshes of the sponges; either they may be left in water for many days, so that the fibrin may rot out, when, after much washing, they must be kept in a

solution of carbolic acid, 1 in 20, till required; or they may be soaked in a solution of common washing soda, one pound to a quart of water, for twenty-four hours, with frequent squeezing, at the end of which time they must be soaked in many waters, to get rid of the soda, and then treated as before, but in either case they should soak for the twelve hours preceding an operation in carbolic acid, solution, 1 in 20.

Points to be borne in mind with regard to sponges, in addition to those already alluded to, are the following:— Firstly, the sponge that is used for washing up the skin previous to commencing an operation had better be put on one side. Secondly, if pus or any foetid matter is met with during the operation, sponges had better not be used, but cotton-wool; where the use of a sponge is unavoidable, it should not be returned to the others, but should be at once destroyed. Cotton-wool should be used, too, wherever any fœces have been discharged; in case of any sponge having been introduced within the bowel, it should be put on one side for the remainder of the operation, and afterwards destroyed.

Count the sponges before an operation and see that the number is correct before the wound is closed. Never tear a sponge during an operation, as this might lead to a mistake in the count, with the result perhaps that one is left behind in the cavity of the abdomen. Sponges should be handed to the assistant in a small basin, and should on no account be laid on blankets or other unprepared surfaces; if a sponge should fall on the floor, it had better be put on one side, or at least very carefully washed in the antiseptic before being returned to the operator.

The more entirely we can dispense with sponges, the more likely are we to have successful asepticism; in this direction the employment of a jet of antiseptic fluid playing on the wound is an important contribution. This is easily



done by having a glass tube with a fine nozzle attached to the uterine douche apparatus. (See Fig. 5, page 83).

*Sutures.* The materials most commonly used as sutures are silk, catgut, silver wire, and silkworm gut, fine silk or catgut being also employed as ligatures for tying any bleeding vessels. With regard to the antiseptic treatment of these, it is well, in the case of silk, especially stout silk such as is used for tying the pedicle of an ovarian cyst, to boil it in a carbolic solution, 1 in 20, for ten minutes previous to use. Chromic catgut, silver wire, carbolised catgut, and silkworm gut, should be soaked for, at least, half-an-hour in a carbolic solution, 1 in 20.

*Instruments.* The care of the instruments frequently devolves on the nurse. Before an operation they should be immersed for at least ten minutes in a warm solution of carbolic acid, 1 in 40; it is not sufficient that part of the instrument should be in the antiseptic, it is absolutely necessary that the whole should be submersed. If instruments are laid in carbolic solution much longer than ten minutes they very readily rust; it is a good plan on the night preceding, or on the morning of the operation, to immerse them in briskly boiling water for about five minutes. This is an excellent way of maintaining them in an aseptic condition. At the close of the operation, the instruments should be at once cleansed in plain warm water, with the aid of a nail brush, which should be very religiously reserved for this purpose. The parts which require the most careful attention are the eyes of needles, the crevice between the blade and the handle of a knife, the teeth and catches of forceps, the lock of scissors and forceps, any screw arrangement such as a clamp, also the chain of an ecraseur, and particularly any complex instruments such as Sir Spencer Wells' ovariectomy trochar. The rule to be followed is to take every instrument to

pieces that allows of doing so, carefully to cleanse each part, and then to put them together again.

Instruments should be washed immediately the operation is over, and where any considerable number have been in use, it is necessary to count them, both before the operation is commenced and before it is completed, so as to ascertain that none have been left within the abdomen. It is of cardinal importance that they should not be put away dirty, otherwise they may soil their wraps and be re-infected from this source, although, subsequently, every care be taken to keep them in an aseptic condition. A striking case of this kind was recorded in which the wash-leather, in which a doctor carried his midwifery forceps, was the unfortunate vehicle, time after time, of carrying infection to puerperal women.

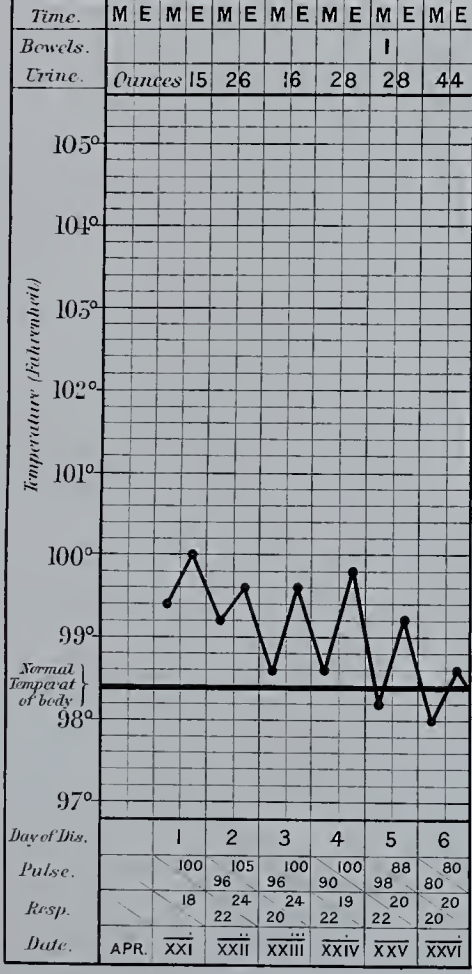
When instruments have been used in a case recognized as of a highly infectious nature, it becomes necessary to wash them repeatedly in strong carbolic lotions, or to immerse them in perchloride of mercury, 1 in 500, for some hours, afterwards having them re-nickelled; or they may be thoroughly boiled or kept at a temperature of 300, F., for some hours in a suitable oven; the last course, perhaps, is the best.

It will be well to remember that carbolic acid, 1 in 20, soon takes off the edge or point from instruments; it is, therefore, well not to put scalpels or needles into the antiseptic solution till about ten minutes or so before an operation.

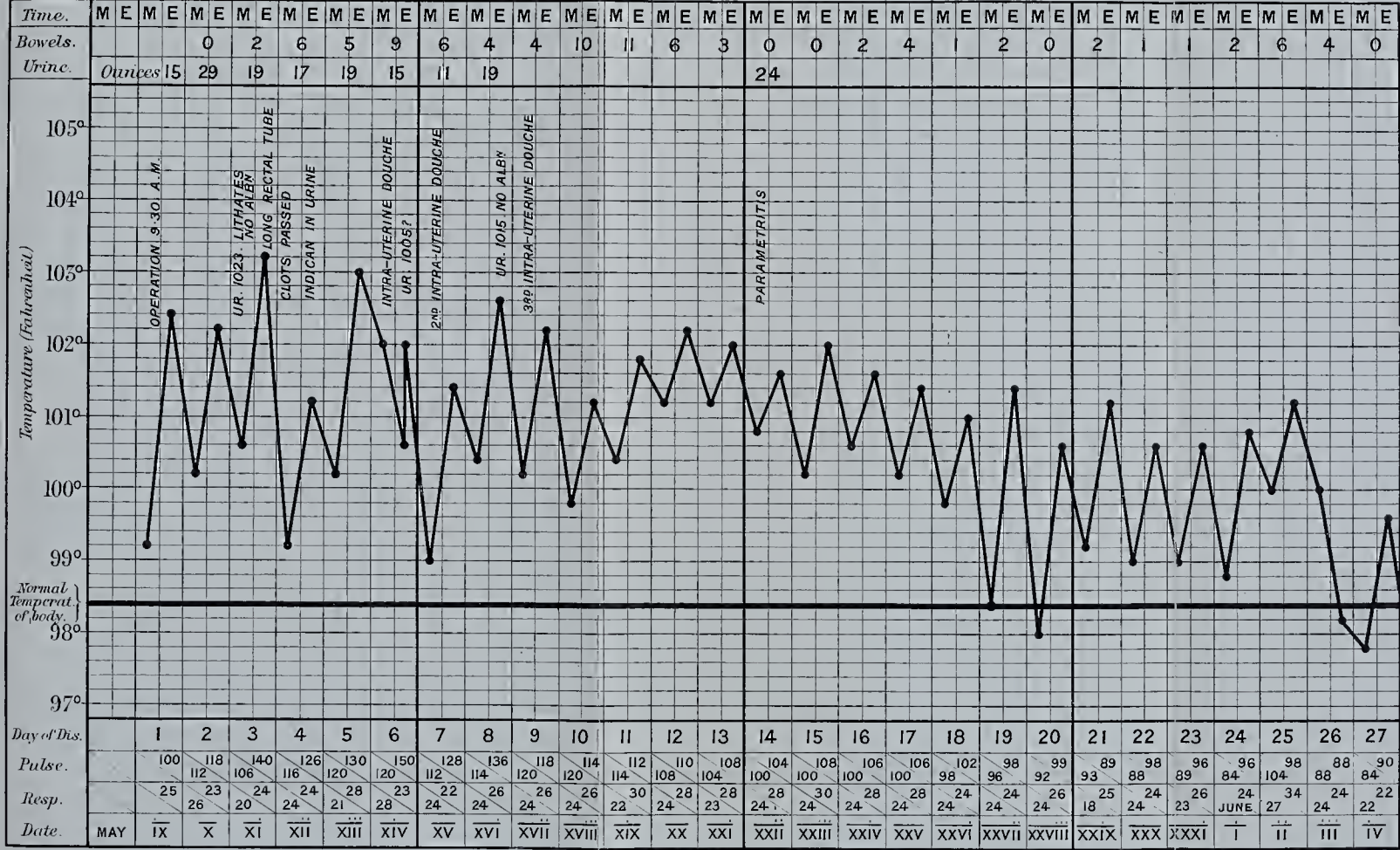
Further, it must never be forgotten that perchloride of mercury is decomposed by *metallic* instruments, with the result that mercury is precipitated on to the metal, destroying its lustre, blunting the edge of knives and the point of needles, and causing all very readily to rust.

*The douche.* There is no single apparatus in the equipment of the obstetric nurse, the careful employment of which is a greater boon to the patient than the vaginal

E. G. AGE, 45. BLOOD CYST ON THE RIGHT OVARY.



G. W. AGE, 23. CESAREAN SECTION. MAY 9TH 1889. LIVING CHILD







or uterine douche; nor one, the improper use of which, constitutes a greater danger.

A douche is used for one of three purposes. Firstly, its object may be the application of heat or cold to the womb or its neighbourhood, by means of a current of hot or cold water. Secondly, it may be employed with the object of exerting some distinctly remedial effect on the vaginal mucous membrane, on the womb or the surrounding structures, by means of some medicinal reagent dissolved in the douche fluid. Thirdly, it may be employed for the simple purpose of cleansing the vagina and freeing it from all septic matter.

To be successful in attaining either of the first two purposes, it is essential that the patient should be lying on her back, so that the fluid may accumulate at the upper part of the vagina, and thus keep the neck of the womb constantly immersed in a pool of slowly flowing fluid, in this way allowing the necessary time for the temperature of the water to exert its effect, or for any remedy to be absorbed by the mucous membrane or surrounding parts, In every case, therefore, it is very desirable that the patient should be provided with a bed-bath (Fig. 3), and in midwifery practice this becomes a necessity.

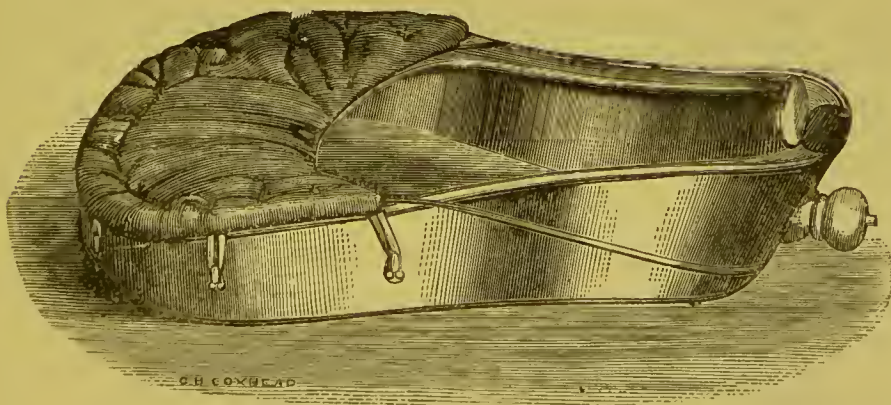


Fig. 3.

In cases where the patient is unprovided with this most useful apparatus, she may fulfill the necessary condition,

as was first pointed out by Dr. Emmett, if she lies across the bed with the hips at the extreme edge, and each foot supported on a chair. Beneath the buttocks is placed a mackintosh, so that the fluid, as it flows from the vagina, may be received into a pail beneath the bed.

When the object in view is simply the cleansing of the canal, the patient may sit at the edge of a chair, or supported between two chairs. For self-injection, the bidet (Fig. 4) is very useful.

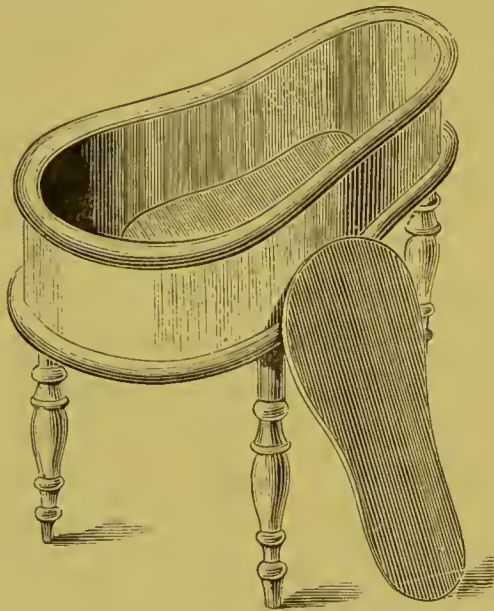


Fig. 4.

The douche apparatus (Fig. 5) consists of a reservoir, to which is attached india-rubber tubing, provided with suitable stopcocks, and terminating in the vaginal tube, which may be of vulcanite, india-rubber, or glass, but should not be of gum-elastic, on account of the liability of this material to crack and form crevices in which septic matter may lodge.

In hospital practice it is of great importance that each patient should have her own vaginal tube; neglect of this precaution has been attended with dire results. The douche reservoir should, moreover, be provided with a small secondary reservoir (D. Fig. 5), so that the vaginal

tube, immediately on its withdrawal, may be immersed in an antiseptic fluid, and not, as is almost invariably done with the idea of preventing any dripping, returned into the douche-reservoir. Attention to this precaution cannot be too urgently required, as its neglect cannot fail to be a source of danger. If, for example, the patient were suffering from uterine cancer, very probably the tube would carry into the reservoir some particles of tissue endowed with septic qualities of the most intense virulence.

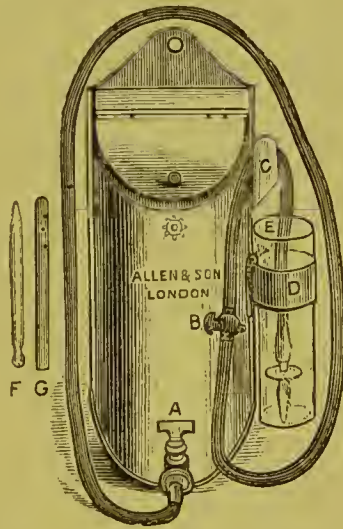


Fig 5.

The most suitable solution for the small reservoir is a saturated solution of boracic acid. The reservoir should be provided with a lid, in order to keep out the dust. The tubing should not be of unnecessary length, or it will allow of the water becoming too cool before it reaches the patient, and it, as well as the taps, should be of sufficient calibre to allow of the free flow of the injection. Where a douche is used after the repair of a ruptured perinæum, the vaginal tube should be of soft india-rubber, in order to avoid damage to the newly-repaired tissues. Every such tube, of whatever material constructed, should be provided with lateral spray-openings, so as to avoid the risk of the unintentional injection of the uterus—an accident which is accompanied with severe symptoms of colic.

For operation purposes, instead of a vaginal tube, a strong glass or cellulite tube may be attached to the douche (F. Fig. 5), so as to produce a fine jet of fluid, thus keeping the surface of an operation wound, not only free from blood, but also from septic matter.

Messrs. J. Allen and Son, 21, Marylebone Lane, Oxford Street, W., have taken much pains to carry out my suggestions, and supply a thoroughly efficient antiseptic apparatus.

The mode of administering a douche is as follows:— Water of the temperature required, or a little hotter, having been mixed in a jug with any medicinal remedy as prescribed, is poured into the reservoir. The external genitals of the patient, as she lies on the bed-bath, are first cleansed with an antiseptic fluid, such as perchloride, 1 in 1,000, by means of cottonwool, but never with a sponge, the vulva is then syringed, and *whilst the stream is still flowing*, the tube is introduced into the vagina, whilst with the other hand the contraction of the womb is maintained by gentle friction and pressure. The height of the reservoir should be about two feet above the level of the patient. The tube should be withdrawn before the reservoir is quite empty, or if it is necessary to refill it, this should be done before the water is quite exhausted, so as to avoid the entrance of air into the tube. The vaginal tube is then replaced in its own reservoir.

If the details prescribed above are rightly followed, several sources of error or danger will be avoided. It is well, therefore, to bear the following points in mind:— (1) never mix any antiseptic or other medicinal reagent in the douche-reservoir lest the remedy be of very different strengths in different layers of the fluid, (2) the flow of water, though free, should not be of any great force lest the cavity of the uterus be injected and uterine colic result; (3) always cleanse most thoroughly



any secretion from the vulva, so as to avoid introducing from without any septic matter into the vagina; (4) let the fluid run for some little time before introducing the tube, so as to drive out the air, in this way avoiding the danger of forcing air into the open mouths of any veins, an accident which would manifest itself by the gravest symptoms; (5) do not use the same vaginal tube for more than one patient; and lastly, see that this is kept in an antiseptic solution till next required.

If the uterus itself is to be injected, a suitable tube will be requisite, one that allows of the ready return of the injection, thus avoiding the risk of forcing fluid along the Fallopian tubes into the peritoneum.

If the douche-apparatus above described is not at hand, it becomes necessary to use a Higginson's syringe in order to irrigate the vagina. In this case, it is imperative that each patient should have her own syringe, and, if possible, that it should be a new one for each confinement; the dangerous practice of chemists loaning such syringes has already been condemned. Before using the syringe it should be soaked in an antiseptic solution, the fluid being pumped freely through it in order to ascertain that the valves are in good working order. The antiseptic prescribed is then mixed in a basin with the proper proportion of water, the temperature of which should be a little hotter than is actually required, so as to allow for the unavoidable cooling; this is then pumped through the apparatus so as to expel all the air, and after well syringing the external parts, the tube is introduced within the vagina, the stream flowing all the time, and the injection is continued till the fluid is nearly exhausted. All unnecessary force must be avoided, and great care exercised to see that the syringe does not contain any air before the injection is commenced, and that none is admitted into the apparatus through the distal part of the tube coming out of the fluid.

*The Catheter.* Every nurse engaged in obstetric practice should be able to pass the catheter without exposing the patient.

There are some operators who consider it necessary to have the catheter passed, so as to ensure that the bladder is empty before the patient is put on the operating-table; the tendency of the surgery of to-day is in the direction of using this instrument as little as possible, so that the routine practice of relieving the bladder in this way for the first week after the pelvic or abdominal operation is no longer so common as it was.

The catheter should be of silver or of indiarubber, but should not be of gum elastic; some new female catheters of toughened glass seem very suitable, but great care must be taken before the introduction of such to see that the instrument is not cracked, otherwise the end might be left in the bladder.

Immediately before and after use a catheter should be washed through with a stream of water, and in the intervals of its employment it should remain constantly in a solution of antiseptic,—boracic acid seems the most suitable or carbolic acid, 1 in 20, does well. A tooth-brush dish makes a very suitable vessel for the immersion of the instrument.

Before passing the catheter it is absolutely necessary to cleanse the vulva of all possible septic matter by means of cotton-wool wrung out of antiseptics and not with a sponge; the catheter should then be lubricated with carbolic vaseline. The patient may lie either on her back or on her left side, but whichever position is adopted, it is necessary to bear clearly in mind the anatomical relations of the urethra.

If the patient is on her back, the way to perform this little operation with the greatest ease is as follows:—having lubricated the catheter and the forefinger of the right

hand with a little carbolic vaseline, the nurse, standing, at the right hand of the patient, whose knees are drawn up, holds the instrument in the palm of the hand so that its point rests on the forefinger about half an inch from the tip, whilst its shaft is directed towards the inner border of the wrist. The tip of the index finger seeking the urethral prominence at the base of the smooth triangle already described, slips the point of the catheter into the orifice and directs its further progress as it is pushed onwards by the forefinger and thumb of the left hand. When the instrument is well in the urethra, say half an inch, the right forefinger is withdrawn and the catheter taken into the right hand, its point being made to travel upwards and forwards by depressing the hand well towards the perinæum. In order to prevent the patient or the bed being wetted in withdrawing the instrument, it is requisite to plug its orifice, either by pressing the pulp of the finger against it or by closing the little valve provided for that purpose. The vessel to collect the urine should be placed beneath the patient's knees, or, in some respects better, the catheter may be provided with an indiarubber tube long enough to conduct the urine under the bed ; in this case there is no fear of the water trickling over the patient, but additional care is necessary to keep the arrangement aseptic.

If the patient is lying on her left side, the catheter should be held in the nurse's right hand, and its point directed into the urethra by the tip of the left forefinger as it lies immediately behind the orifice ; the right hand must then be directed well towards the perinæum so as to cause the point of the instrument to enter the bladder. It sometimes happens that, when the urine has ceased to flow, pushing on or withdrawing the instrument slightly, allows a considerable further quantity of water to pass.

*The enema.* The *rectum*, or *lower bowel*, plays such an important part in the symptoms which attend diseases

peculiar to women, that, although strictly speaking it does not concern us in the study of antiseptics as applied to obstetrics, still a few words on this subject may not be out of place.

Rectal injections are used for a variety of purposes ; to procure evacuation of the bowels, to restrain diarrhœa, to ease pelvic pain, to administer medicine or nourishment, and to destroy intestinal worms. Each of these conditions is of interest to the obstetric nurse.

Many symptoms which are ascribed to disease of the womb are really due to a loaded bowel ; moreover, after a pelvic or abdominal operation the employment of an enema is so frequently requisite that its due performance is a matter of no little consequence. An injection of this kind should act, not only by emptying the lower bowel of any hard lumps, but also by stimulating the intestines higher up to expel their contents. The most convenient position for its administration is as the patient lies on one side or the other,—by preference the left, as that is the side most commonly adopted for an obstetric examination. In giving a copious enema,—a little operation which requires some skill,—it is necessary that the fluid should be injected very slowly ; as soon as the patient complains of colicky pains or distension, the nurse should pause, supporting the perinæum, when there is any tendency to reject the fluid, with the hand covered with a soft towel. It sometimes happens that, owing to the bowel being blocked high up with hard masses (called scyballæ) or else from actual obstruction in the rectum by impacted fæces, the injection is at once returned ; in this condition a soft tube may be passed through the mass so as to enable the injection to reach the intestine above the obstruction, or it may be necessary in such a case to remove the mass by hooking it away with a couple of fingers. If the bowel is so irritable that the injection is returned ounce by ounce, one of two



courses must be adopted according to the urgency of the case ; either the perinæum must be supported with a soft towel, or two fingers must be passed along the side of the tube so as to stimulate the sphincter to increased effort.

The patient should retain the injection as long as she can, say, for ten minutes or more, and should afterwards relieve herself with the least possible effort.

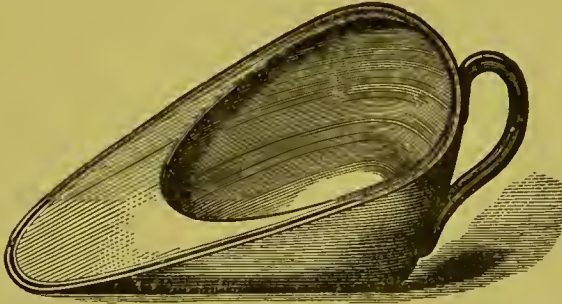


Fig. 6.

Fig. 6 represents a bed slipper of japanned metal, as manufactured by Messrs. Allen and Son. It is free from the danger of breaking, and is so constructed as to allow of thorough cleansing.

With respect to *quantity*, if the object be to promote a thorough emptying of the bowel, a copious enema must be employed, say two, three, or even four pints. The *fluid* used may be either plain water, soap and water, or thin gruel, to either of which various substances such as turpentine or olive oil may be added. With regard to such, it is important to remember that, being lighter than the water, they tend to rise to the surface, the consequence of which is, that if the oil be added to the whole bulk of the injection, the greater part will soon rise to the top of the fluid and probably escape being injected at all ; the proper course, therefore, to follow is to beat up the oil with some three or four ounces of fluid, and, having injected this, to follow it up with the injection of the remainder.

Glycerine is a remedy which has of late made very

rapid progress in popular and professional favour as a means of evacuating the bowel; it is best administered from a special piston-syringe, holding the required dose, one teaspoonful.

The use of large injections is not confined to the emptying of the bowels; they are also of great service in soothing pelvic or abdominal pain, much in the same way as the application of hot water in the form of a douche does.

Enemata are further used to restrain diarrhœa; for this purpose a small quantity of some bland material, such as starch, is employed, to which may be added laudanum, in fifteen to thirty drop doses. An injection, which is of great service in restraining the frequent motions that very commonly characterise septic poisoning, consists of two drachms of spirits of turpentine in two ounces of olive oil.

During every abdominal operation, half-a-pint of good beef tea should be ready, so that, in the case of the patient becoming faint, it may be injected with or without the addition of brandy. After the operation, with the object of minimising the vomiting which frequently supervenes, it is customary to feed the patient for at least the first twelve hours by nutrient injections; these are conveniently replaced by the nutrient suppositories of Burroughs and Wellcome, which may be had either in the form of milk or meat in a state of pre-digestion.

A teaspoonful of salt or a drachm of tincture of steel in half-a-pint of water is the usual injection for the destruction of thread-worms. A Higginson's syringe is probably the most convenient instrument for an evacuant injection, and a two to four ounce ball syringe is the most suitable for a nutrient or emollient enema.

Whatever form of enemata apparatus is employed, however, it should never be forgotten that as soon as the nozzle, which in all cases must have been previously oiled,

has passed the sphincter, its point should be directed backwards, so as to avoid pressure on the septum, between the vagina and bowel ; the importance of this is of course greatly increased if the perinæum has recently undergone repair. In the plate, opposite page 49, the star marks the point in the recto-vaginal septum where the enema-nozzle is apt to perforate.

One very important duty which falls to the nurse, and one which she should try to cultivate to the utmost of her ability, consists in observing the patient ; in this field she is really the representative of the doctor during his absence, for he sees the patient very much through the eyes of the nurse, as it is impossible for him to form a trustworthy opinion of the patient's progress, unless the nurse fills up for him the blank occurring between his visits. As soon as a patient comes under a nurse's care, she should make it her duty to take the temperature, at least, night and morning. She should save also for examination specimens of the night and morning urine. The frequency with which the temperature should be taken after a confinement or operation, depends on circumstances, but every four hours is a suitable average. The rate of the pulse and of the breathing should also be noted ; for this purpose a watch with a second hand is an absolute necessity. The pulse should be counted for half a minute, and whilst the patient still thinks that it is under observation, the breathing should be reckoned, as any consciousness on the patient's part is sure to influence its rapidity. Rise of temperature, or even more, rise of the pulse rate, calls for immediate attention, and the doctor in attendance should be at once informed.

The aspect of the patient and her general bearing are of very great importance. Any complaint of chilliness should at once be noted and reported, as well as any tenderness or pain in the stomach. The condition of the

digestive organs should be watched ; any nausea or actual vomiting, constipation, diarrhœa, thirst, loss of appetite or flatulent distension of the abdomen always demand attention. The state of the skin should be observed for the development of any rash, or for excessive perspiration. Any diminution of the milk or fetor of the discharge should at once be reported.

If a nurse keeps a record of her case, she will not only have, in such, a pleasant memento of it, and a record for future reference, but will also, by so doing, greatly serve the doctor.

Benton's diet-charts are very helpful, showing at a glance the hourly record of food, medicine, sleep, &c., as well as the occurrence of any symptoms such as those alluded to.

A temperature-chart should also be kept, so as to show at first sight the progress of the case, including not only the temperature, pulse, and breathing, but also the state of the bowels and the quantity of the urine. The principal points in the progress of the case can also be noted on such a chart by writing across it. Plate 3, page 81, represents charts of four cases treated at the Hampstead Home Hospital, and gives a fair idea of how they may be kept, and how very valuable they are for purposes of reference.



## Chapter VI.

INSTRUCTIONS SPECIAL TO ANTISEPTIC GYNÆCOLOGICAL OPERATIONS—THE PREPARATION OF THE ROOM AND OF THE OPERATING-TABLE—WHAT TO PREPARE FOR THE OPERATION—PREPARATION OF THE PATIENT—COMMON MISTAKES DURING THE PROGRESS OF THE OPERATION—THE DRESSINGS AND THEIR RENEWAL—ABDOMINAL SECTION, DRAINAGE OF THE PERITONEUM—PERINÆORRAPHY—EMMETT'S OPERATION—ALEXANDER'S OPERATION—GENERAL RESUME—ANTISEPTIC PRECAUTIONS IN THE OUT-PATIENT GYNÆCOLOGICAL CLINIQUE.

**I**N this chapter, one has to consider in detail, the antiseptic precautions essential to success, in preparing for a gynæcological operation.

In the first place, as regards the preparation of the *room*, one must note that the position of the operating table depends on the nature of the operation. There are three chief positions in which the patient may lie for this purpose, viz., on the back, on the left side, or with the knees drawn up in what is technically known as the "lithotomy" position. The operating table must, therefore, in each case, be so arranged as to obtain the best available light. The plate opposite page 97 represents a private room in the Hampstead Home Hospital, prepared for an abdominal operation. It will be observed that the patient's feet, lie towards the window, and somewhat to the right of it, so that neither the hands of the operator himself, nor the body of his assistant, impede the light. If the operation is to be performed in the left lateral position, the feet of the patient should be directed slightly to the left of the window. For the lithotomy position, the table must be placed a little aslant

the line of illumination, in order that the operator may not be in his own light.

*How to extemporise an operating table.* This may be formed from a couple of dressing tables arranged either lengthwise, or better still, in the shape of an L, so that the short limb can be used to hold the Chloroformist's necessities. The legs of the tables should be tied together, in order to prevent their becoming disjoined, should it be found advisable to shift the patient during the operation. On the table thus arranged are laid a couple of folded blankets, a mackintosh, and a clean sheet, with one or more pillows, as may be agreeable to the patient.

*The instrument table.* In a position handy for the operator should be placed a small table, on which the instruments can be laid in their trays of warm carbolic lotion, as well as a basin of carbolic, 1 in 40, in which, from time to time, the hands may be rinsed. In every case the instrument table is placed at the doctor's side, but in an abdominal operation it should be at his right hand, between him and the light; in a left lateral operation, to his left, nearer the patient's head; and in a lithotomy operation, on either side, as may be most convenient to his hand. Small instruments, such as Wells' artery forceps, may be conveniently immersed in antiseptic solution, contained in an earthenware jar or similar vessel, the necessary condition being that the entire instrument should be submerged. Beneath this table may be placed a cautery, or other battery, should such be employed.

*The sponge table* should be placed where most convenient to hand the sponges to and from the assistant; this is generally to the patient's left, not far from the head of the table. Care must be taken that sufficient room is allowed to enable the nurse to pass to and from the door. On this table should be placed the sponges, comprising two flat ones, twelve ordinary, and half-a-dozen small

ones for use on sponge-holders ; two china dressing pails in which to wash the sponges ; four small basins and two receivers ; a china jug and funnel, ready for the irrigation of the peritoneum ; a twenty-ounce glass measure, and at least a dozen towels. Beneath the table should be placed the bed-bath, four cans of hot and cold water, and four pails to receive the soiled water, or any ovarian fluid.

The abdominal mackintosh, two dressing mackintoshes, and two mackintosh aprons, should be found on the corner of this table.

The douche-reservoir should be suspended from the wall at a convenient height.

A table must also be set apart for the *dressings*, and on this must be placed the following articles :—Lint, cotton-wool, salicylic, iodoform or carbolic wool, one piece of gutta-percha tissue, and one of protective ; a dozen strips of plaster,  $1\frac{1}{2}$  inches wide and of the necessary length ; some iodoform or carbolic gauze, and some few pads of cotton-wool. If much discharge is expected, as after hysterectomy, many such pads of absorbent wool must be prepared. There should also be in readiness a pair of forceps, a pair of scissors, a box of pins, and of safety pins, needles and cotton (one needle should be ready threaded), broad and narrow tape, six roller bandages, an abdominal or many-tailed bandage, and also the following :—Chloroform, ether, olive oil, carbolised oil, glycerine, iodoform, tincture of steel, tincture of iodine, solution of ammonia, brandy and hypodermic solution of morphia ; also a hypodermic syringe, a glass syringe with about eight inches of india-rubber tube attached, a female catheter, and a Higginson's enema syringe.

*The spray*, If the spray is used, it is best to have it at the assistant's left hand, so that the steam may play on to the abdomen without getting into anyone's light.

A chair or high stool should be at hand to enable the

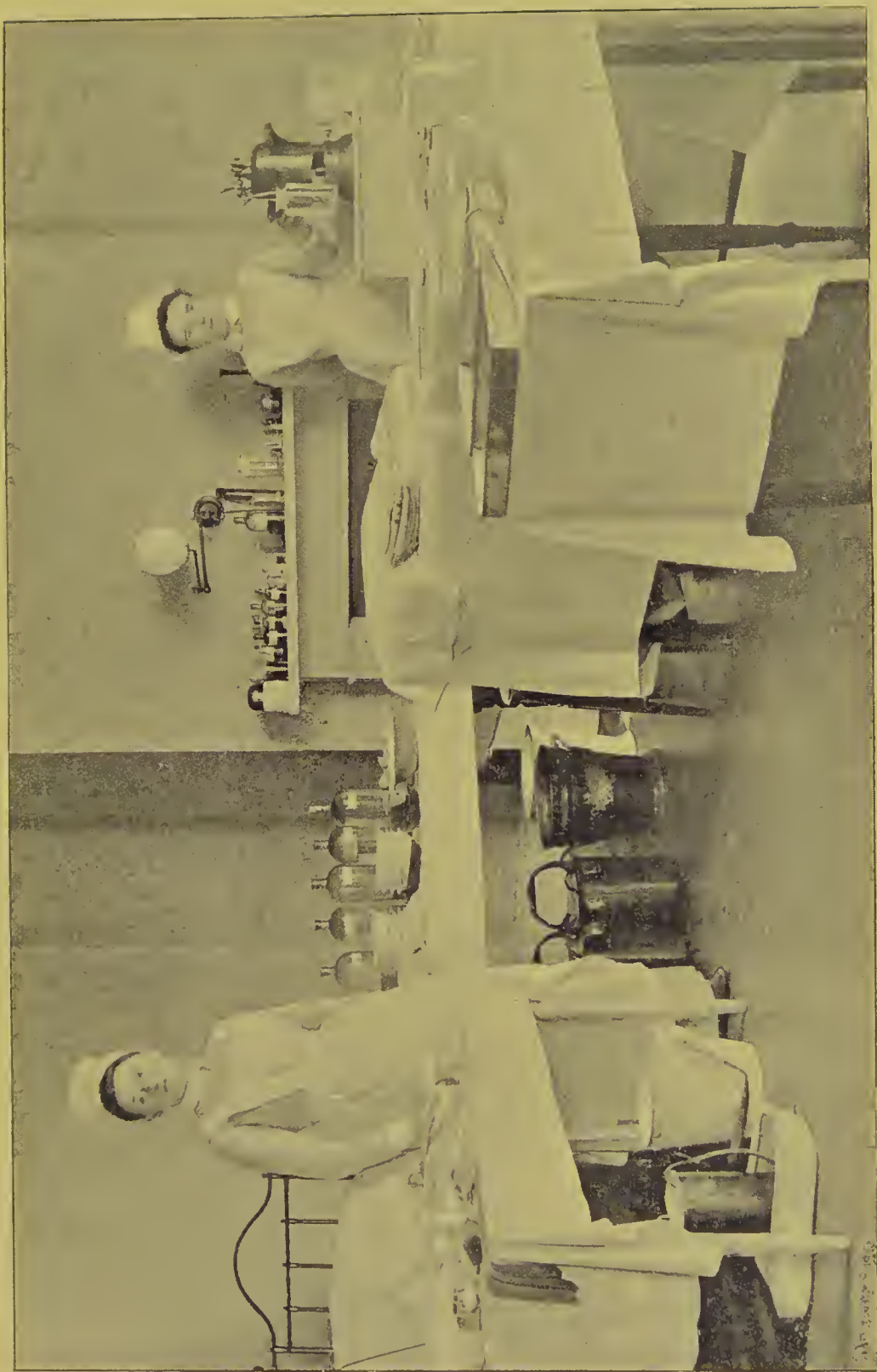
patient to get on to the table, or, better still, she should be anæsthetised whilst in bed, so as to avoid the shock of seeing the necessary preparations. When on the table, the patient must be well protected from chill by a sufficiency of warm clothing; it not uncommonly happens as the result of neglecting this precaution that a patient takes cold during an operation, and the feverish symptoms which supervene are ascribed to septic trouble, when in reality they are due to chill.

*The patient.* A certain preliminary preparation of the patient is requisite for an operation. The night preceding, she should have a warm bath, with abundant application of soap and water, to be followed, after rinsing off the soap, by a wash down with some antiseptic such as Sanitas; especial care must be taken that the organs of generation and the navel are thoroughly cleansed, as they very readily harbour germs.

In preparation for an abdominal operation, it is well, on the preceding night, to shave the pubes, and to apply over the whole abdomen a *compress* wrung out of carbolic lotion, 1 in 40; this should not be removed till the patient is on the operating table. The compress should consist of three thicknesses of swansdown calico or similar material, wrung out of warm carbolic lotion and covered with mackintosh sufficiently large to overlap the edges; over this a sheet of wool, wadding, or flannel is put, and the whole retained in position by a flannel bandage.

The *bowels* should be thoroughly opened by a dose of laxative medicine on the night preceding the operation, followed in the morning by an enema. This enema should be given at least two hours before the time appointed for the operation, otherwise there is great risk of the bowels acting during its performance, an incident which is always embarrassing and may seriously endanger the success of any plastic operation such as that for the repair of a







ruptured perinæum. In all these cases it is advisable to give a nightly dose of laxative, followed in the morning by an enema for several days preceding the operation, as it is quite incredible how long hard masses (*scyballæ* as they are called) may be retained within the bowels, and how difficult it is at times to effect their dislodgement.

An *antiseptic douche* should be given the night before the operation, and the vagina should be subsequently plugged with antiseptic *pads*; in the morning, after the bowels have acted, the pads should be removed and a copious vaginal douche administered, with the precautions already detailed.

*Pads.* These may consist of cotton-wool, or strips of lint, attached to strong twine, by means of which they can afterwards be removed; in either case they are squeezed out of the solution of corrosive sublimate, 1 in 1,000, or of carbolic acid, 1 in 20. As an alternative, boracic acid in powder, or boracic acid with a fourth part of iodoform mixed with it, may be introduced through a speculum and retained in position with a pad of cotton-wool. Whatever course is adopted, the precaution of thoroughly disinfecting the external parts before any internal examination or application is made must never be forgotten.

If the nurse is entrusted with the packing of the vagina, she may most readily do so in the following manner:—The perinæum being hooked back with the left index finger, as the patient lies on her left side, the apex of the speculum, which is held firmly in the right hand, is introduced within the vagina, and is thus made to retract the perinæum, whilst the fingers of the left hand separate the nymphæ, so as to prevent their being pinched by the speculum as it is directed upwards. If there is no speculum at hand, then, by passing the tips of the index and second fingers of the left hand into the vagina, thus alike retracting the

perinæum and separating the nymphæ, the pads may be inserted with the fore-finger of the right hand.

Very nice pads are made by pulling off a thin sheet of cotton wool, say, about  $2\frac{1}{2}$  inches square, bending the edges inwards till they meet in the centre, and fastening them there with a stitch passed through the pad ; about an inch further on, another pad is similarly fastened, and again a third, so that the complete arrangement consists of three discs about the size of a penny, fastened through their centre, at the distance of an inch or so, by a strong piece of twine. The advantage of this over the ordinary kite-tail pad, formed by encircling pledgets of wool in a knot, is that, the wool being evenly distributed, there are no hard places to exert painful pressure on the vagina or surrounding structures.

It should be remembered that, on account of the sickness which is likely to be excited if the stomach contains solid matter, no food should be given to a patient for at least four hours preceding the administration of an anæsthetic ; also that the last meal should be of the lightest description, say a breakfast-cupful of strong beef-tea without anything to eat.

The enema and douche having been given as already detailed, shortly before the hour of operation, the patient must make water ; should she be unable to do so, or if for any reason it is thought well by the surgeon that the catheter should be used, then such must be passed with due antiseptic precautions (see page 86).

It is a great comfort, where practicable, to anæsthetise the patient in her bed, so that she is not disturbed by the sight of any preparations, but whether she is brought into the room unconscious or not, the instrument trays should in any case be covered with a towel, as they will otherwise, in the necessary movement of the patient, get soiled with the fluff from the blankets.



The directions which Mrs. Ebbetts, the Sister-Superintendent of the Hampstead Home Hospital, is wont to supply to her nurses respecting the order in which the various nursing details of the operation should be carried out, merit careful attention, and will be found on page 106; here I would only insist on this, that the nurse, before she commences her duties, must use every whit the same care as the surgeon, and that, again and again, whenever she handles anything which is perchance contaminated with dust, she should rinse her hands in antiseptic solution.

*During the operation*, the following are some of the errors most likely to be committed through inadvertence:

(1) Laying down sponges or instruments on unprepared surfaces, *i.e.*, on surfaces which in the nature of things are not aseptic, *e.g.*, on the blankets. As an illustration of what is here meant, take the following incident: the supply of sutures having failed, the nurse is asked to supply some more; having done so, she threads them into the blanket, so as to have them handy for the operator. A moment's consideration will show that such a simple error might invalidate the most scrupulous antiseptic precautions.

(2) The hands are occasionally wiped on dry towels. It is impossible ever to be sure that such are germ free.

(3) Sometimes a sponge drops on to the floor and then, without previous washing in antiseptic lotion, it is handed to the operator, or replaced with the clean sponges; this, too, is plainly an error.

(4) If the bowels act during the operation, *e.g.*, the repair of a ruptured perinaeum, sponges are sometimes used to mop up the mess, and, after being washed, are again used for the operation. This is wrong, because even an antiseptic solution would not, under such circumstances, ensure the asepticism of any sponge. Wool or tow, or

some similar material, should alone be used for such a purpose, and should immediately afterwards be destroyed. The same applies to any purulent accumulations.

(5) If the spray is used, one or other of the accidents already alluded to (see page 56) may hinder its efficiency.

(6) Tearing a sponge during an operation is always to be deprecated, because it is likely to lead to an error in comparing the sponges counted just before the closure of the wound with the number known to have been brought into the room. A sponge left in the abdominal cavity is one of the most serious accidents in this class of operations.

*Cleansing the surface around the wound.* When the operation has been completed, the surgeon proceeds to wash with an antiseptic, not the wound only, but also the surrounding skin, in order that the germs in the outer air may not be able to find thereon any tract of nutrient material along which they may grow and thus reach the wound. The importance of this precaution was very strikingly exemplified in the flask experiments detailed on page 46.

With regard to the *dressings*, the practice of different operators varies within such wide limits that it is impossible to give any but the most general directions. The nature of the operation, moreover, entails such a variety in the dressings that it will be necessary to sketch the principal ones in some detail, in order that the nurse may have them ready.

First, then, take the ordinary Listerian dressing. The manner in which this proceeds is as follows:—A small piece of “protective,” having been dipped into carbolic lotion, is applied next the wound; it should be just large enough to protect the latter from the overlying dressings. Thereon are laid about four thicknesses of carbolic gauze wrung out of carbolic solution, 1 in 40, and some loose

crumpled gauze is next placed on and around this last, so as to absorb any discharge, and allow of the remaining or chief dressing fitting accurately to the body. This consists of eight thicknesses of carbolic gauze, between the seventh and outermost folds of which is placed a layer of thin mackintosh, the india-rubber or glazed surface of which must be turned towards the wound. Around the edge of the dressing, or all over it, is placed a sheet of carbolic or salicylic wool, the whole being secured with bandages. If the spray has been used, it must be continued till the dressing is applied and the bandaging commenced. The bandages need not be of antiseptic material; elastic webbing is very useful, as it facilitates the accurate adaptation of the dressing to the body.

The time for changing a dressing depends on the presence or absence of oozing, but, under any circumstances, it should be renewed at the end of the week. The spray must always be ready for the hour appointed, and should be actually going from the time that the bandage of the old dressing is undone till the bandage of the new dressing is adjusted.

The tendency now-a-days is to make antiseptic dressings as simple as possible, and to dispense with the spray. An adequate mode of procedure is as follows: The wound and surrounding parts having been well washed with antiseptics and dried, the wound is powdered with iodoform and covered with a little gauze of the same material; over this is laid a large sheet of salicylic wool and the whole is retained in position by strips of strong adhesive plaster. Around all a many-tailed bandage is fixed with safety pins.

It need scarcely be pointed out that the most elaborate antiseptic dressing will not ensure success unless each stage of the operation has been distinguished by the strictest antiseptic precautions.

*Abdominal section.* For an ordinary ovariectomy, a dressing, such as that just described, amply suffices;

where the wound is two or three inches long, the iodoform gauze might be six inches long by four wide, and the salicylic wool about twelve by eight. The length of the strips of plaster depends naturally on the girth of the patient, but they should be about  $1\frac{1}{2}$  or 2 inches wide, and long enough to pass well across the hips and from flank to flank, so as effectually to support the abdomen.

*Drainage of the peritoneum.* In cases where it is necessary to drain the peritoneal cavity, the wound is covered above and below the orifice of the tube with powdered iodoform and gauze, as just described, and the abdomen at once supported by strapping. Over this more iodoform might be dusted with advantage, and a piece of mackintosh, with an opening just large enough to fit accurately on to the tube, is overlaid. The mouth of the drainage tube should now be covered with two thicknesses of gauze, and over and around its orifice some highly absorbent substance, such as Gamgee's absorbent pads, should be heaped; the whole is then covered with a sheet of salicylic wool, and a many-tailed bandage applied outside to keep everything taut and comfortable. The modification now described allows of the external part of the tube being quickly exposed, in order to withdraw its contents, without soiling the remainder of the dressing. This is a very important consideration, and to ensure success it is necessary that the drainage should be attended to for the first time, not later than a couple of hours after the operation.

This duty is often entrusted to the nurse, and a more important and responsible one it is scarcely possible to imagine. After exposing the orifice of the drain by removing the outer dressing, a stout indiarubber tube, of calibre small enough to enter it freely, is gently introduced, till the contained fluid is seen to rise to the level of the abdominal surface. Closing the end of the



rubber tube, not by squeezing, but by sealing it with the finger, enables one to withdraw the contained fluid without spilling; it can then be emptied into a suitable vessel by releasing the finger as the tube is held over it. This process is repeated till the drain is quite empty. Afterwards the tube is syringed through with carbolic solution, 1 in 40, and retained in some of the same till next used.

It cannot be insisted upon too strongly that all rubber articles should be kept in the intervals of their employment, in some antiseptic fluid, either carbolic acid solution, 1 in 40, or in a solution of boracic acid of the same strength; they may possibly wear out a little sooner, but this is not to be considered in a matter of such importance. The Nursing Sister at the Hampstead Home Hospital informs me that a solution of Perchloride of Mercury is the best to preserve indiarubber articles as it is less likely than carbolic acid to lead to their cracking.

*Renewal of dressings.* It has already been remarked that a dressing should be renewed, at the latest, at the end of a week, but in any case where there is oozing from under the border, or through its substance, the dressing must at once be changed, even if the operation is but a few hours old. The object of this precaution is to prevent germs gaining access to the wound along the tract of the nourishing fluid furnished by the discharge. This was well illustrated by the flask experiments already more than once alluded to. Where a large amount of discharge is expected, as for example, after Hysterectomy (removal of the womb), the nurse should be provided with a number of pads of absorbent wool, in order that the blood may, as much as possible, be soaked up without the necessity of renewing the dressing; for it must be borne in mind in the clearest possible way that, as soon as the discharge has reached the surface, the dressing is no longer trustworthy, and must at once be renewed. If, under these circumstances,

it should be impossible immediately to change the dressing, the nurse should dust the soiled spot very freely with iodoform, and cover it with salicylic wool or other antiseptic, fastening the whole with strapping, treating the soiled spot, indeed, much as one does the wound itself. At the best, this is a very temporary makeshift, for the sooner the dressing is renewed in its entirety, the better.

*Perinæorrhaphy.* With respect to the nursing of an operation for the repair of a ruptured perinæum, the habits of different operators differ so widely that a nurse should know what the particular course to be followed may be.

The simplest way of all is lightly to pack the vagina, after it has been douched with an antiseptic and dried, with strips of lint or gauze thoroughly impregnated with a mixture of boracic acid and iodoform; these may remain in position without any signs of putrescence for five to seven days, when they may cautiously be withdrawn in the direction already defined, viz., downwards and forwards. The patient is allowed to make water without the use of the catheter, either as she lies on her back, or, better still, after being turned on to her stomach. The external parts are kept cleansed by gentle syringing twice a day with carbolic solution, 1 in 100, and, after being thoroughly dried with wool, the wound is dusted freely with iodoform, covered with a pad of cotton-wool, and supported with a T-bandage. After the action of the bowels on the fifth to the seventh day, the vaginal dressing is withdrawn, and a douche of perchloride, 1 in 1,000, is given. With this exception, the treatment, or rather the absence of treatment, is continued as before. This simple plan yields very good results, its success very much depending on the initial freedom of the vagina from septic germs.

Whatever plan is followed in the after treatment of ruptured perinæum, it is necessary for a few hours after

the operation to tie the knees together with a bandage, taking care that some wool is placed between them to prevent painful pressure. The habit of some doctors is to keep the knees fastened during the whole of the first week, but, provided that the patient understands that she must not move herself, the most perfect results may be obtained without inflicting on her what is really a very grievous restraint.

The plan of treatment which is diametrically opposed to that just described, consists in douching the vagina twice daily with antiseptic solution, washing out the rectum, also twice in the day, with antiseptics, and passing the catheter as often as it is necessary for the patient to relieve her bladder. If the instructions given are those just detailed, great care must be taken, both in the use of the vaginal douche and of the enema, to remember the anatomical relation of the parts to which attention has already been drawn (see pages 51 and 52).

The first action of the bowels usually takes place on the fifth day from the operation, but, like other things, varies in the practice of different surgeons, and is always an event of very great moment. The best course to pursue, so that there may be no hard pieces to tear open the newly repaired perinæum, is to inject half a pint of warm oil after giving a little laxative medicine.

The nursing of an *Emmet's operation* (the repair of a laceration in the neck of the womb), is precisely similar to that of a ruptured perinæum.

The dressing of an "*Alexander*" (shortening the round ligaments), is of the simplest; dusting with iodoform, covering with lint wrung out of carbolic oil and a pad of antiseptic wool, the whole being kept in position with a bandage; a capital form of such is that designed by the Nursing Sister at the Hampstead Home Hospital, which is essentially a T-bandage, the upright limb of which is split

into two, so as to allow of one tail being brought over each groin and fastened with a safety pin to the abdominal band opposite the hip.

One of the small flat spirit-lamps, usually supplied with 'etnas,' is a very useful addition to the nurse's armentarium, as it allows of strapping being very readily heated without the delay which arises from trusting to the fire or to the hot-water bottle.

The following is a resumé, with slight modification, of the directions furnished by Mrs. Ebbetts, of the Hampstead Home Hospital, to her nurses, and will be useful, as summarising in a brief form, much of that which has been treated more fully in the preceding chapters.

#### ABDOMINAL SECTION.

Preparation of the patient. The night before the operation, give the patient a warm bath of soap and water, rinsing with plain water and then sponging down with a weak solution of Condyl's fluid or with Sanitas. Pay especial attention to the navel and to the external organs of generation. Put on a clean nightdress, and then give a douche of carbolic acid solution, 1 in 100, or of perchloride, 1 in 1000, and pack the vagina with antiseptic pads. Over the abdomen lay a compress of three thicknesses of lint wrung out of carbolic solution, 1 in 40; cover this with some thin mackintosh and a sheet of cottonwool, fastening the whole with a flannel bandage. Give one ounce of castor oil or two teaspoonfuls of liquorice powder. Four to five hours before the operation, give half a pint of strong beef-tea, nice and hot. Two hours before, give a copious enema of soap and water. Repeat the douche of the previous evening, after having thoroughly cleansed the vulva and anus, and withdrawn the pads, Just before the operation see that the patient passes water and again cleanse the vulva. The catheter not to be passed unless ordered. Remove any false teeth and do the hair in two plaits.



Have the sponges above suspicion to begin with ; soak them all night in carbolic, 1 in 20, and during the operation wash them in tepid water and plenty of it, then in 1 in 40 carbolic, and lastly in boiling water, wringing them out in a carbolized towel just as they are handed to the assistant in a small basin.

Make the bed in the ordinary way with a mackintosh under the sheet. Have ready, as a support for the knees, a large pad covered with mackintosh and sheeting, and fastened with safety-pins.

On the morning of the operation, put two hot-water bottles in bed, and a cradle ready underneath, a kettle on the fire and some beef-tea in a saucepan to keep hot ; also a china-lined saucepan in which to boil the sutures in carbolic acid, 1 in 20. (Remember this does not apply to catgut in any form). Have ice ready outside the room. Open the window from the top, if the weather at all allows of it ; maintain the temperature at 60 to 65. Unless the spray is used, have two carbolic vaporisers going for the hour preceding the operation.

If the pubic hair has not been shaved off the previous night, hand the carbolic oil to the assistant as the compress is taken off, and afterwards a sponge dripping with carbolic lotion, 1 in 20, in order to wash the abdominal surface. Then hand the fenestrated mackintosh, the adhesive part of which has been thoroughly heated in order that it may stick readily. Again hand the sponge with carbolic lotion, so as once more to wash the exposed skin and the adjacent part of the mackintosh. Upon the abdominal mackintosh, put two dressing mackintoshes, one above and the other below the abdominal opening. To the assistant, hand two towels wrung out of carbolic lotion, 1 in 20, in order that they may be used to cover the dressing mackintoshes, thus forming surfaces on which instruments, etc., may be laid without danger. Keep the

assistant supplied with clean, warm sponges. If the trochar is used, see that the pail is handy and that the end of the tube drops into the pail. If the abdomen is to be irrigated, get the hot water ready so that the irrigation may proceed according to the mode in favour with the operator, but before this is begun see that receivers are ready to catch the water. Be prepared with a basin in which to put the tumour when removed.

Just before the wound is closed, see that the sponges and artery forceps are all accounted for. Get ready a fresh bowl of carbolic acid, 1 in 40, for cleansing the parts around the wound.

If the dressing is a regular Listerian one, hand the dressings in the order described; if not, according to the needs of the case, that is according as drainage is, or is not employed. In the former case, prepare a complete set of fresh dressings as soon as the patient is comfortably in bed.

Whilst the patient is being returned to bed, remove the hot water bottles and put the pad under her knees and the cradle over the abdomen, replace the hot-bottles and wrap the patient warmly up.

Have the enema of beef-tea,  $1\frac{1}{2}$  ounces with brandy half an ounce, ready to administer if the surgeon so orders.

Nowhere is the adoption of antiseptic precautions of greater import than in the Out-patient Clinique of our hospitals. In the interests of the individual the vulva should be well wiped with a pledget of wool wrung out of perchloride solution before any internal examination is undertaken, especially if such entails the passage of the sound; and to prevent infection from one patient to another, not only should the hands be carefully washed immediately before any examination, but they should also be well rinsed in the antiseptic. The instruments, speculum, sound, etc., should be well washed immediately after use with soap and

water and then rinsed in the perchloride. The examining finger and all instruments should be lubricated with an ointment composed of iodoform and vaseline, or of half-per-cent perchloride vaseline. It must not be forgotten that both these ointments will not improve either steel or electro-plated instruments, so that, when done with for the day they should be very carefully freed from any such antiseptic.

## Chapter VII.

INSTRUCTIONS SPECIAL TO ANTISEPTIC MIDWIFERY—WHAT TO PREPARE IN THE LYING-IN ROOM—WHEN DOUCHES ARE TO BE USED—DRAINAGE AND HOW IT IS FACILITATED—ANTISEPTIC CARE OF THE BREASTS AND THE PREVENTION OF CRACKED NIPPLES AND ABSCESS—ANTISEPTIC PRINCIPLES IN THE INTEREST OF THE INFANT—PREVENTION OF “THRUSH”—CLEANSING OF FEEDING BOTTLES—THE PREVENTION OF INFLAMMATION OF THE EYES IN THE NEWLY-BORN—THE DRESSING OF THE CORD—ANTISEPTICS IN THE AFTER TREATMENT OF VACCINATION—RESUMÉ OF ANTISEPTIC RULES FOR MONTHLY NURSES—CONCLUSION.

**I**N<sup>st</sup> this, the concluding chapter, we shall be occupied with the application of antiseptics to midwifery and the care of young infants.

Unless we look on child-birth as a process, in which there are brought into play agencies as important as can exist in any operation, we cannot but fail in the due appreciation of the important function at which it is our duty to assist. Until we are willing to exercise the same care in an ordinary case of maternity as we would in a Cæsarian section, we have failed to grasp the scope and responsibilities of antiseptic midwifery.

If practicable, the patient should have a warm bath at the first indications of labour, her bowels should be opened with a dose of mild laxative medicine or by an enema. The bed should be made with a piece of new mackintosh or with one that has undergone thorough antiseptic purification, and instead of the folded sheet which is generally used as a draw sheet, one of Southall's sanitary sheets may with advantage be substituted.

The nurse's first duty is to prepare two bowls of antiseptic lotion, and this is readily done by dissolving



in two separate pints of water two of Dr. Cullingworth's perchloride powders, one powder in each basin. The one basin is kept for rinsing the hands and the other for washing the genitals of the patient.

No examination of any kind must be made till the hands are cleansed according to the directions already given on page 75, including the subsequent rinsing in the perchloride, nor till the vulvar fissure has been disinfected with a similar solution. Never must a nurse use a sponge to the genitals of the patient; it is absolutely impossible to maintain a domestic sponge in a state suitable for obstetric practice; cotton-wool wrung out of the perchloride solution must in all cases be substituted for it. (See the tube D in the frontispiece and the observations on pages 47 and 49).

If the hands are aseptic and the outer generative organs have been disinfected before any examination is made, it will not, under ordinary circumstances, be necessary to use a vaginal douche at all. If, on the other hand, the patient has suffered from any discharge previous to her confinement; if the labour has been very prolonged; if a vaginal examination has been made without due disinfection of the hands; if the patient is suffering from new growth of the womb or passages, or has a foetid discharge arising from the maceration of a dead foetus, then it becomes necessary to give an antiseptic douche with all the precautions already detailed (see page 80).

With regard to all vaginal examinations, this is certain—the fewer the better. The finger should be first lubricated with carbolic vaseline, 1 in 8, or with vaseline, in which perchloride of mercury, two grains to the ounce, is mixed. The hand must be disinfected afresh before every vaginal examination.

After the relief, either of the bladder or the bowels,

also as the head passes the perinæum, the antiseptic cleansing of the external parts must be renewed.

Immediately after the birth and subsequent expulsion of the after-birth, the perinæum should be inspected for any laceration, in order that it may be at once repaired, if such be found to exist. Where, however, no such damage is present, the external parts are simply washed with a little antiseptic lotion, dried with cottonwool and left alone, or covered with Southall's sanitary towels which are a great improvement on the diapers in general use, regarding the cleanliness of which it is impossible to be sure. In this case no vaginal douches are necessary.

The circumstances in which antiseptic injections are needed in the after-progress of the case are, in addition to those already enumerated, the following:—Laceration of the perinæum or vagina; tedious labour from obstruction whereby the tissues are probably considerably contused; imperfect contraction of the uterus with retention of fragments of membrane, of placenta or of blood-clot; also where there is any foetor of the lochia.

The object of true asepticism is to allow nature to follow its own beneficent course and to interfere as little as possible with her. Antiseptic injections are, therefore, only of service, where we have transgressed the laws of health or where the patient is already suffering from disease. But, inasmuch as we may transgress without knowing it, antiseptics give us a confidence which we could not otherwise have.

Free-drainage as a principle of the antiseptic method has already been alluded to; in the case of the puerperal woman, this is provided for, to a certain extent, by the normal position of the womb, and is favoured by allowing the patient, on the second or third day, to be raised a little in bed, the shoulders being supported on pillows. The nurse must see that the binder is properly adjusted, and in

cases where the patient has been exhausted by a long labour, by previous ill-health, or by severe loss at the time of her confinement, this suggestion is not to be followed.

Many of the conditions referred to as demanding antiseptic douches in the after-treatment of the lying-in period, really require the use of intra-uterine injections, which are to be given with the precautions insisted on in the previous chapter; they are generally undertaken by the doctor himself, and certainly should not be attempted by anyone who has not had considerable experience of midwifery.

As to the fluids to be used for these injections, in simple cases a weak solution of carbolic, 1 in 100, or of Condyl's fluid, suffices; in more serious cases, a solution of iodine, a teaspoonful of the tincture to a pint of water, is of great service; whilst the most reliable of all, though not without dangers of its own, even in the hands of skilled persons, is the solution of perchloride of mercury, 1 in 2,000. In the case of this last, it is well both to begin and end the injection with plain water, or with a solution of iodine.

The conditions enumerated above have not by any means exhausted the applications of antiseptics in the interests of the mother and her infant.

The comfort and safety with which a mother can minister to the wants of her offspring depend on the breasts being in a healthy state, and there is one condition which may absolutely prevent her continuing to nurse the child, viz., cracked nipples. The suffering arising from this affection may, in the efforts to persevere in suckling, amount to positive agony, and finally prevent any further attempt in this direction.

With the object of guarding against this accident, it is necessary, during the last few weeks of pregnancy, to harden the nipple and the areola by means of some astringent application such as that recommended by Dr. Kucher, which consists of a mixture of ten per cent. of tannic

acid with tincture of myrrh. Precautions antecedent to the confinement are not enough ; they must be continued during the early weeks of lactation. Each time that the baby has been at the breasts, the nipples must be dried with cotton-wool, and, after being painted with the tannic-myrrh, must be dusted with zinc oxide. If the astringency of these remedies is unpleasant to the patient, it may be corrected by covering up the nipple with a small piece of lint soaked in almond oil.

The reason for these precautions lies in the necessity for removing all facilities for the growth and development of mould or other lowly organisms on the nipple and areola damp with the milk exuding from the breast. Unless this is effected, not only may thrush form in the infant's mouth, but the skin over the areola and nipple may so far be invaded and consequently weakened by the extension into its substance of the proliferating germ-life, that fissures very readily result.

Cracked nipples are sometimes the cause of an affection even more serious in nature, viz., abscess of the breast. Germs entering at the fissures, pass along the lymphatics and set up inflammatory changes which may eventuate in abscess. It is possible, however, that these lowly atmospheric organisms may produce abscess of the breast without any wound or crack of the nipple, by entering the breast along the course of the milk ducts. The irritation resulting from the fermentative changes thus set up in the milk induces inflammation of the glands, the consequence of which may be the formation of an abscess.

Mothers sometimes err in allowing the infant to lie for hours at a time with the nipple in its mouth in order to keep it soothed and quiet. This is a great mistake, as the child's stomach has no opportunity of securing its necessary rest, but is irritated by containing milk in all stages of digestion, so that very evidently dyspepsia



must soon result. A child's meals should be regular from the very first day of its birth. Although not in the strictest sense a question of the application of antiseptics to obstetric nursing, the relation of suitable feeding is so germane to our subject, that a table of the regulations in use at the North-West London Hospital, for the instruction of mothers and others, are placed as an appendix at the end of this chapter. These rules were drawn up by a Committee, consisting of Dr. J. H. Edwardes, Dr. Luff, and the author, and will, it is to be hoped, prove useful.

Due regard, then, to the strict antiseptic cleanliness of the breast is as essential to successful nursing as asepsis to the safety of the mother during the lying-in period.

Closely connected with this subject, because the disease arises probably from the activity of the same or similar organisms, is the production in the infant of an affection called "thrush." This occurs in the form of white patches on the tongue; on the roof of the mouth, or elsewhere on its walls; or in the throat. Under the microscope this white substance is seen to consist of the spores and filaments of a species of mould, the special interest concerning which lies in the fact that it is probably the same fungus as turns milk sour, and consequently must be one of very wide diffusion.

In the plate opposite page 42, figs. 3 and 5 represent the microscopical appearances of the mould of thrush and of some which grew on sterilised gelatine after simple exposure to the atmosphere for a short period. It is easy to understand that if the nipples are not kept dry and clean, they may readily become a centre for the development of such a mould, and that from the breasts this can be transferred to the infant's mouth.

If the mother is unable to nurse her child and it has to be brought up artificially, the importance of bearing in

mind the universal, ever-threatening character of this mould is immensely increased, for it is not too much to say that imperfectly cleansed bottles are the death-warrant of thousands and tens of thousands of infants every year in this country.

Let us suppose that a bottle, or the indiarubber tube or teat, has not been thoroughly cleansed. The traces of milk become a source of nourishment, on which the spores of the mould may develop, and the next time that the child is fed, not only the organisms themselves, but also the products of their activity, are taken into its system. Here they still further develop, leading alike to local manifestations, as in "thrush," and to general derangement of health, due to the fermentative changes in the food exciting various catarrhal conditions of the stomach and bowels. From the diarrhœa and vomiting the child is quickly exhausted, especially as the local condition in the mouth makes it difficult and painful for it to suck.

Should the child's constitution be so vigorous that it survives this condition of things, only too probably the seeds have been sown of some life-long weakness of digestion and all the evils attendant thereon, for it must be clearly understood that for every child that loses its life through inattention to the sanitary conditions affecting its nutrition, perhaps a dozen are weighted for the remainder of their days by some weakness or another, directly or indirectly traceable to the early months of their existence. Asepsis is the key to the position.

Of course, if a child is fed on improper food that is another matter. It is no unusual experience, amongst the lower classes in the out-patient clinique, to find that an infant of twelve to eighteen months is fed on food which is outrageously unsuitable to its age. "Just the same as we have, sir!" Milk alone is the proper food for infant life. It must not be kept in the room but in the airiest and

coolest place obtainable, being covered over with muslin. At each meal the milk mixed with the necessary proportion of water is first boiled, so as to ensure the destruction of any germs, either in the one or in the other, and then allowed to become sufficiently cool.

The bottles, of which it is best to have 'only one in use at the time,—seeing that, the more there are, the more difficult it will be to keep them clean,—should be of the old-fashioned boat pattern which dispenses with the use of rubber tubes. There must be an extra bottle for night service, so as to avoid the necessity of its cleansing after the midnight meal. The objection to tubing is twofold. In the first place it is very difficult to keep clean, and in the second place, the facility with which such a bottle can be put in the cot at the babe's side, so that it may solace itself with a draught now and again, is a temptation to the nurse and a danger to the child. An infant's meals should be as regular as an adult's, for it is essential that the stomach should have its periods of rest, and that it should not be constantly at work on food in all stages of digestion.

Immediately after use, the bottle must be scalded out and both teat and bottle should be thoroughly cleansed, first in water and then in weak Condylion solution, or in a saturated solution of boracic acid. It is far better that both the bottle and the teat should be kept in water till the next meal; the fact that the teats get soft and require more frequent renewal is scarcely a valid objection to this course, but, under any circumstances, the teats must be again thoroughly washed, with frequent squeezing, immediately before use. It will be understood that the bottle and the teat must always be separated before cleansing, and kept separate till again required.

In the interests of the baby there are yet three other applications of antiseptic principles to which allusion must be made. Dr. Cullingworth, in the address which has

already been cited, quoted from a Report in 1884, of a Committee of the Ophthalmological Society of Great Britain, which shews that in the institutions for the blind in London, York, Hull, and Belfast, 30 to 40 per cent. of the inmates owe their blindness to purulent ophthalmia in infancy. "Hence," he says, "if we can prevent ophthalmia in the newly-born, it seems not unreasonable to infer that we shall thereby diminish the amount of blindness existing in this country by one-third." With respect to the means to be adopted in order to gain this desirable end, one cannot do better than quote the following from his address:—"Everyone is now alive to the importance of wiping the child's eyelids with a clean, dry napkin as soon as the head is born, and, if possible, before the eyes are opened; but it is possible to add a further and still more reliable preventive. The application of a weak solution of corrosive sublimate to the eyes immediately after the child has been washed and bathed will almost certainly destroy any virus that may have been lodged there. For this purpose, a small quantity of the 1 in 1,000 solution of corrosive sublimate should be diluted with twice the quantity of warm water, so as to reduce the strength to 1 in 3,000. The nurse should soak a small piece of rag or cotton-wool in this solution, and, holding the eyelids apart with the thumb and finger of the one hand, should with the other squeeze the rag or wool, first over one eye and then over the other, in such a way that the solution may run freely over the eyeball.

The application causes little or no smarting, and seldom produces any irritation. Now that solution of corrosive sublimate is in very general use in the lying-in room, it would involve very little trouble to adopt this thorough disinfection of the eyes as a routine practice. Should the mother be known to be suffering from a purulent vaginal discharge before labour, a stronger and



more penetrating preventive should be used. The medical attendant should himself, under these circumstances, put into each eye, within a few hours of the child's birth, one drop of a 2 per cent. solution of silver and nitrate, as recommended by Credé. The application causes some irritation ; it does not, however, need to be repeated."

For the purification of the infant's eyes under ordinary circumstances it has been my custom of late to use a solution of boracic acid, made by dissolving a teaspoonful of the powder in a tumbler of warm water ; this may be used very freely to the eyes, two or three times daily, in case of any irritation occurring. Separating the eyelids, as described above, the nurse pours the solution over the eyeball, and thus flushes out any secretion ; it is painless, and at the same time apparently effectual.

In the good old days, now for ever gone, when puerperal fever existed in extended epidemics of intense virulence, it was observed that numbers of infants were attacked with peritonitis, the umbilicus evidently being the gate whereby the poison gained ingress to the abdomen. The old-fashioned way of charring the linen in which the cord is wrapped was decidedly an attempt to keep it aseptic, though it comes down from a time long antecedent to the modern theory of antiseptics. Boracic acid has been used with the 'idea of keeping the cord aseptic, but as it appears to hinder the natural process of drying, which is essential to the cord dropping off at the right time, it is better, as suggested by Dr. Cullingworth, to adopt the following routine :—After having passed the cord through the centre of a square of antiseptic gauze (or, failing this, the charred lint would be the best substitute), heap it well all over and around with dry starch, or with a mixture of starch and zinc oxide, then, having folded it up, apply the binder in the ordinary way. Treated thus, the cord should drop off on the fourth or fifth day, when the

resulting wound may be dressed with boracic acid powder.

After Vaccination, the adoption of antiseptic precautions will greatly modify the discomfort suffered by the child. If, from the eighth day onwards, the part is kept constantly soft with lanoline, the irritation will be greatly reduced, and the pocks will heal without the formation of the usual scabs, which are only too often coverings for deep and unhealthy ulcers.

Although nothing on which we have dwelt is without value in the maintenance of asepsis in the lying-in room, still there are certain rules of paramount importance, which it may be well, following the example of Dr. Playfair, to summarise in a brief form. The powders referred to are those recommended by Dr. Cullingworth, each of which contains ten grains of perchloride of mercury, with fifty of tartaric acid, and half a grain of carmine as colouring matter; the perchloride vaseline contains two grains to the ounce. I must explain, moreover, that the rules themselves, in accordance with my individual belief and experience, differ somewhat from those of Dr. Playfair.

#### ANTISEPTIC RULES FOR MONTHLY NURSES.

1. One of the "Perchloride powders" dissolved in a pint of water will make a solution of the strength of 1 in 1,000. Your first duty is to prepare in each of two basins this quantity of solution, to renew them at the termination of the labour and each morning for the first week.

2. The one basin is to be used for the purification of the syringes, vaginal and rectal pipes, and all utensils, such as bed-slippers, &c., which are used in the patient's service. The second basin of solution should stand by the bedside, and is to be used, firstly, for rinsing the hands on every occasion previous to touching the patient in the neighbourhood of the genital organs, whether for the

purpose of washing or for any other object whatever; secondly, for the purpose of cleansing the genitals, whether for examination or otherwise.

3. Under no circumstances must a sponge be employed for cleansing. Pure cottonwool, wrung out of perchloride solution, must alone be used for this purpose, a fresh piece on each occasion, and on no account should the wool be re-dipped, when once soiled, into the lotion.

4. Vaginal pipes, enema tubes, &c., should be smeared with perchloride vaseline before use.

5. Unless express directions are given to the contrary, no douches are to be given. The external parts are to be cleansed with the perchloride solution three times daily.

6. The temperature is to be taken every four hours, except whilst the patient is asleep, and any rise above 100 F. is to be at once reported.

7. All soiled linen, diapers, etc., must be immediately removed from the bedroom.

In conclusion, let me remind the reader that there is no royal road to success; by patient, painstaking, and conscientious attention to detail alone can we hope to gain for our patients the unspeakable benefits that are offered to humanity through the life-work of Semmelweiss and Lister.

## Appendix.

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### DIRECTIONS FOR FEEDING INFANTS.

#### I.—NURSING.

In the interests of mother and infant alike, it is most important that the child should be nursed at the breast. No sugar and butter or castor oil should be given at birth ; the early breast-milk does all that is necessary.

After the first day, the frequency of nursing should be the same as described below (see HAND FEEDING). An infant should never be fed because it screams, or because it has been sick, but only at the stated intervals, unless asleep. Suckling should not be continued beyond the tenth month ; beyond this, it is bad both for mother and child. No food containing solids should be given until at least two teeth are cut.

#### II.—HAND FEEDING.

To Mothers who are unable to suckle their children, the following directions are given :—

The bottle must be kept scrupulously clean. It should be scalded out directly after use, and kept till again required in a basin of water which is coloured pink with Condyl's Fluid or a few permanganate of potash crystals.

The milk should always be fresh cow's milk, boiled as soon as received.

The barley-water (to be prepared fresh every day) is made by boiling a table-spoonful of pearl-barley in a quart of water for half-an-hour. Both milk and barley-water should be kept (separate and covered over) in the coolest and airiest place available, till required. Mix in the proper quantities for each meal, and add a little white sugar. Feed very slowly.

During the FIRST MONTH, feed the infant every two hours in the day (from 6 a.m. to 10 p.m.), and two or three times in the night, with half a teacupful of milk and barley water, mixed in equal quantities. If



the child is sick, give instead one table-spoonful of milk with two of barley-water.

During the SECOND and THIRD MONTHS, give three parts of a teacupful of the above mixture every two-and-a-half hours in the day, and twice in the night.

During the FOURTH MONTH, give a teacupful of milk and barley-water, in the proportion of two parts of milk to one of barley-water, every three hours in the day, and once in the night.

During the FIFTH and SIX MONTHS, give a teacupful and a half of the same every three hours in the day and once in the night.

After the SIXTH MONTH, give a teacupful and a half of a mixture of three parts of milk with one of barley-water, seven times in the twenty-four hours.

No starchy foods (such as bread, common flour, corn flour, arrow-root, sago, tapioca, rice, special infants' foods, &c.), should be given until at least two teeth are cut, and at first the daily quantity of such food should be very small. While the teeth are being cut, a hard crust of whole-meal bread may be given for the child to bite. No potatoes should be given until the child is A YEAR old, and no meat till EIGHTEEN MONTHS old. From the SEVENTH MONTH, a little veal broth or mutton broth, in which a vegetable, such as carrot, has been boiled, may (after being strained) replace one of the milk meals, in the same quantity.

If the child is sick or has diarrhœa, the food must be made more dilute by lessening the milk, and must be given less frequently. A tablespoonful of lime-water may also be added to each meal.

If raw meat pulp is ordered by the physician, prepare it thus :—Scrape with a knife the soft pulp from uncooked beefsteak, mix this pulp with enough sugar to sweeten it, and give a teaspoonful two or three times a day.

## Glossary.

- ABDOMEN**, the belly.  
**Abortion**, an untimely birth.  
**Anesthesia**, the condition of freedom from feeling.  
**Anesthetics**, remedies that induce anesthesia.  
**Antiseptic**, that which is opposed to the causes of putrefaction.  
**Areola**, the small open space (circle) around the nipple.  
**Aseptic**, the condition of freedom from the causes of putridity.
- CERVIX**, the neck of the womb.  
**Cesarian Section**, the operation for the delivery of the child by opening the womb through the external abdominal walls.  
**Coagulum**, that which is curdled or congealed ; generally applied to clots of blood.  
**Cyst**, a tumour containing fluid.
- ECRASEUR**, an instrument for crushing the neck of a tumour.  
**Empirical**, that which rests on trial or experiment.  
**Empyema**, a collection of pus in the chest.  
**Emunctory**, an organ which discharges from the body material no longer of service, for example the kidneys and bowels.  
**Etiology**, the science of the causation of disease.
- FENESTRATED**, provided with windows or small openings.  
**Fetor**, offensive odour.  
**Fæces**, the excrement from the bowels.
- GENITALIA**, the outer generative organs, or "privates."
- Gestation**, the act of carrying the young in the womb.
- HEMORRHAGE**, a flow of blood.
- LESION**, a hurt or wound.  
**Leucorrhœa**, the discharge called "whites."  
**Lochia**, the discharge following confinement (see page 6).
- MENSTRUATION**, the monthly period.  
**Metritis**, inflammation of the womb.  
**Multipara**, one who has borne many children ; frequently used for those who have born more than one.
- NYMPHAE**, the lesser or inner lips protecting the orifice of the vagina.
- OLECRANON**, the bone composing the point of the elbow.
- PAPULE**, a small solid pimple.  
**Parturition**, the act of bringing forth young.  
**Pedicle**, the foot-stalk which forms the neck of a tumour.  
**Pelvis**, the basin composed of the hips and the lower bones of the spine, which contains the lower bowel, the bladder, and in the female the organs of generation.  
**Perineorrhaphy**, the operation for the repair of a ruptured perinæum.  
**Placenta**, the after-birth.  
**Primipara**, one who has born a child but once.  
**Purulent**, composed of pus.

Pus, that which has become putrid ;  
applied to the matter of abscesses, etc.

RIGORS, shivering fits, accompanied with chattering of the teeth.

SCYBALLÆ, hard masses of  
fæces.

Sepsis, the condition of putrefaction.

Septic, that which induces putrefaction.

Septum, a fence, the division between two cavities.

Slough, the dead part which is cast off from a sore.

Sound, the silver rod with which the interior of the womb is measured.

Speculum, the mirror tube or other form of instrument which enables one to look at the neck of the womb.

Sphincter, the muscle which binds tight the orifice of a viscus, such as the bowel or bladder.

Suppuration, the act of gathering pus underneath.

TROCHAR, a tube for drawing away fluid from the body.

UMBILICUS, the navel.

VASCULAR, containing vessels, arteries, veins, etc.

Vesicle, a pimple, on the top of which a little collection of fluid has formed.

Viscera, the internal organs, such as the bladder, bowels, etc.

ZYMOTIC, caused by fermentation ; applied to diseases having germ-origin, for example, cholera, typhoid fever, etc.

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ERRATA.

- Page 32. For "ajacent" read "adjacent."  
 Page 92. For "charts of four cases" read "charts of two cases."

















